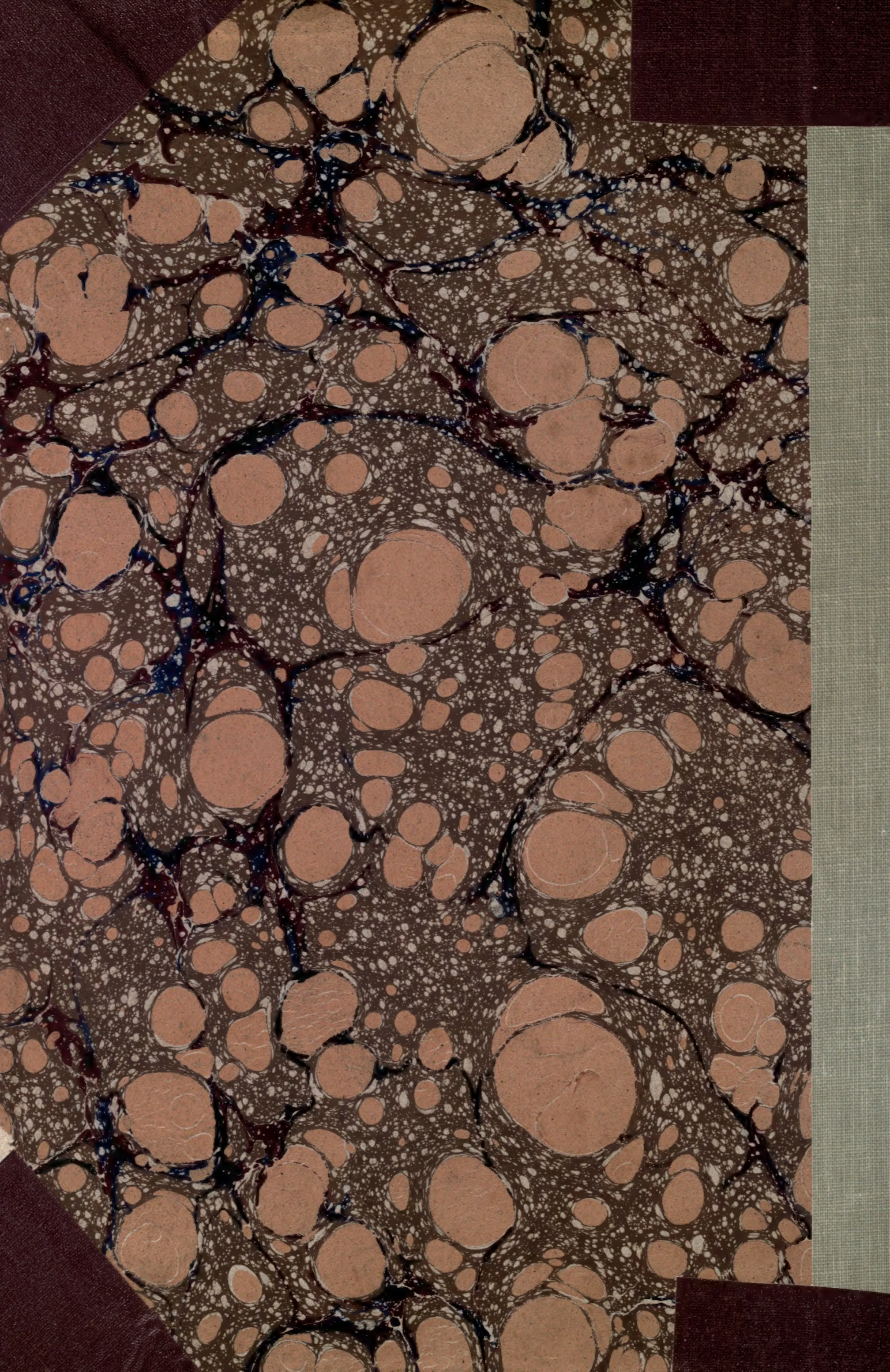

BUFFON LINNÆUS

THE MUSEUM OF NATURAL HISTORY.

WITH INTRODUCTORY ESSAY ON

THE NATURAL HISTORY OF THE PRIMEVAL WORLD.

BEING A POPULAR ACCOUNT OF THE
STRUCTURE, HABITS, AND CLASSIFICATION OF THE VARIOUS DEPARTMENTS OF
THE ANIMAL KINGDOM.
QUADRUPEDS, BIRDS, REPTILES, FISHES, SHELLS, AND INSECTS,
INCLUDING THE INSECTS DESTRUCTIVE TO AGRICULTURE.

BY

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CURATORS IN THE ZOOLOGICAL DEPARTMENT OF THE BRITISH MUSEUM.

[1859-62]

VOL. I.

LONDON, GLASGOW, & EDINBURGH.
WILLIAM MACKENZIE.

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THE MUSEUM OF NATURAL HISTORY.

Drawn by F. O. Finch.

E. Indicus. Indian Elephant.

[1859-62]

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BIBLICAL NATURAL SCIENCE;

BEING

THE EXPLANATION OF ALL REFERENCES IN HOLY SCRIPTURE

TO

GEOLOGY, BOTANY, ZOOLOGY, AND PHYSICAL GEOGRAPHY.

BY THE REV. JOHN DUNS, D.D., F.R.S.E.,

LATE EDITOR OF THE NORTH BRITISH REVIEW;
AUTHOR OF "MEMOIR OF REV. JOHN FLEMING, D.D., PROFESSOR OF NATURAL SCIENCE, NEW COLLEGE, EDINBURGH;"
"CHRISTIANITY AND SCIENCE," ETC.

SEVERAL features distinguish this Work from others in which kindred topics are dealt with.

The place in Biblical Literature which it seeks to occupy, is at present vacant. There is no single work existing which is devoted exclusively to the same subjects.

British and foreign books of Eastern travel may be numbered by hundreds. Scattered throughout these, which are for the most part expensive, very many facts are to be met with which shed much light on those aspects of the sacred text now chiefly in view. Efforts have been made to render this information most truly useful, by embodying it in one work. Thus far the Author's task has been one of compilation. But this forms only a very subordinate characteristic of the Work.

Great attention continues to be given, both in this country and America, to the relations between the Bible and Science. These are still discussed in highly influential quarters. The sounds of the warfare reach the intelligent classes in the community. They have not, however, any one work easily within reach, treating both of the causes and the bearings of those great controversies which will not fail to be waged with growing keenness as science advances. Though it would be unprofitable to dwell, in a controversial spirit, on the various theories of creation and of the natural history of man, which, during the last twenty years, have had great prominence given to them, yet an acquaintance with these must be valued by every lover of truth, and especially by all who receive the Bible as the fully-inspired word of God.

The chief difficulties in the relations between the Bible and Science, are associated with the opening pages of scripture. A full exposition will be given of the first eight chapters of Genesis. And, in connection with the exposition, recent "Geological Theories of creation," "The Theory of Development by Natural Law," and that proposed by Mr. Darwin on "The Origin of Species," will be carefully reviewed, and set in popular aspects. Questions touching the "Presence of Death in the world before the Fall of Man," the hypothesis of a "Race of Preadamite Men," "The Unity of the Human Race," and the "Extent of the Deluge," will all be considered in the introductory pages of this Work.

Again; those only who have studied the scriptures from the points of view of advanced science, can be fully aware of the great light which may be shed on their meaning by Geology, Botany, Zoology, and Physical Geography. Nor is this to be reckoned of little moment. Every illustration drawn from the works of God, and every figure used by men who spake as the Holy Ghost gave them utterance, must be interesting. Intelligent men have thankfully received the contributions which, in recent years, have been made to the elucidation of scripture, by those who, sound in the faith, have either devoted themselves to the study of the original languages of the Bible, or have brought a trustworthy historical criticism to bear on the discoveries of Champollion, Lepsius, Layard, Rawlinson, Wilkinson, and others. It is fitting, then, that the students of Natural Science should bring their gifts and lay them upon the same altar.

The title given above, indicates the special design of this Work. But it will often be necessary to give matter which could not well be specified on the title-page. Information will be drawn from Metallurgy, Meteorology, Astronomy, and, occasionally, from Archæology. When needful, a sketch of the civil history of particular countries and places will be introduced. It is hoped that the Work will thus be found both popularly useful, and, also, interesting to theological students and ministers of Christ.

"BIBLICAL NATURAL SCIENCE" is written from the point of view of Christianity rather than of Theism. It is kept in mind throughout that the Saviour of sinners was himself the Creator of all things. Thus "when on earth all things served him, from the greatest to the least, even to the fishes that walked through the paths of the sea. He was Lord over nature, and having nothing, yet in his Father's care for him was truly possessed of all things."

The Work will be completed in about Twenty Parts, price Two Shillings, each part consisting of Forty-eight Pages of Letterpress, and, alternately, Two and Three Pages of Engraved Plates, in addition to the numerous Woodcut Illustrations introduced in the text.

AN OUTLINE

OF THE

CLASSIFICATION OF MAMMALIA.

FIRST GROUP—PLACENTAL AND VIVIPAROUS MAMMALS.

ORDER I.—BIMANA,	*Hominidæ;* Man.
ORDER II.—QUADRUMANA,	*Simiadæ;* Monkeys of the Old World, *i.e.*, Anthropoid Apes, True Apes, Monkeys Proper, and Baboons. *Cebidæ;* Monkeys of the New World, or American Monkeys. *Hapalidæ;* Marmozets. *Lemuridæ;* True Lemurs. *Lichanotidæ;* Indris. *Nycticebidæ;* Loris, Galagos, Potto. *Tarsiidæ;* Tarsiers. *Cheiromyidæ;* Aye-aye of Madagascar. *Galeopithecidæ;* Flying Lemur of Java.
ORDER III.—CHEIROPTERA,	*Vespertilionidæ;* Pipistrelle, Noctule, Serotine, Barbastelle, Long-Eared Bat, &c. *Rhinolophidæ;* Horse-shoe Bats. *Phyllostomidæ;* Vampires, African Leaf Bat. *Pteropidæ;* Kalong, &c.
ORDER IV.—INSECTIVORA,	*Talpidæ;* Moles, Star-Nose, Chrysochlore. *Soricidæ;* Shrew-Moles, Shrews, Musk-Rat, Elephant-Mouse, Solenodon, Bulau, &c. *Tupaiadæ;* Tupaias. *Erinaceadæ;* Hedgehogs, Tenrec, Sokinah.
ORDER V.—CARNIVORA,	*Ursidæ;* Bears, Badgers, Racoon, Ratel, Glutton, Coatimondi, &c. *Mustelidæ;* Weasels, Martens, Sable, Ermine, Otters, Skunk, Teledu, Grisons, &c. *Viverridæ;* Civets, Ichneumons, Genet, Rasse, Paradoxure, Mangue, Galet, &c. *Hyænidæ;* Hyænas, Aard-Wolf. *Canidæ;* Wolves and Dogs, Foxes, Jackal, Fennec, Lycaon, Lalande. *Felidæ;* Cats, Leopards, Lion, Tigers, Puma, Jaguar, Cheetah, Lynx, Ounce, Serval.
ORDER VI.—PINNIPEDIA,	*Phocidæ;* Seals, Sea-Leopard, Sea-Bear, Sea-Lion, Sea-Elephant. *Trichecidæ;* Walrus.
ORDER VII.—RODENTIA,	*Sciuridæ;* Squirrels, Marmots, Flying Squirrels, Jelerang, Assapan, Souslik. *Myoxidæ;* Dormice. *Dipodidæ;* Jerboas, Alak-Daargha. *Muridæ;* Mice, Rats, Hamster, &c. *Arvicolidæ;* Voles, Water-Rat, Lemmings, Slepez. *Castoridæ;* Beaver, Musquash, Coypu. *Hystricidæ;* Porcupines, Shore-Mole, &c. *Octodontidæ;* Octodon, Schizodon, Spalacopus, Habrocome, Ctenomys. *Chinchillidæ;* Chinchilla, Chincha, Viscacha. *Cavidæ;* Cavies, Agoutis, Capybara, Paca. *Leporidæ;* Hares and Rabbits, Calling Hare, Ogotona.

Order VIII.—Edentata,	*Manidæ;* Pangolins or Scaly Ant-eaters.
	Myrmecophagidæ; True Ant-eaters, Tamandua, Aard-Vark.
	Dasypidæ; Armadillos, Pichichiago.
	Bradypidæ; Sloths, Unau.
Order IX.—Ruminantia,	*Bovidæ;* Oxen, Bison, Buffaloes, Musk Ox.
	Ægosceridæ; Goats and Sheep, Ibex.
	Antilopidæ; Gnoos, Antelopes, Eland, Harte-Beest, Bubale, Prong-horn, &c.
	Camelopardidæ; Giraffe.
	Cervidæ; Stags, Elk, Rein-deer, Roebuck, Muntjak, Musk-deer.
	Camelidæ; Camels, Llamas.
Order X.—Solidungula,	*Equidæ;* Horses, Zebras, Quagga, Ass, Kiang.
Order XI.—Pachydermata,	*Elephantidæ;* Elephants.
	Rhinoceridæ; Rhinoceroses.
	Hippopotamidæ; Hippopotamus.
	Tapiridæ; Tapirs.
	Suidæ; Boars, Wart-Hogs, Peccaries, Babyroussa.
	Hyracidæ; Dasse, Daman.
Order XII.—Cetacea,	*Balænidæ;* Mysticete, Razor-back, &c.
	Catodontidæ; Cachalot or Sperm Whales.
	Delphinidæ; Dolphins, Porpoise, Beluga, Narwhal.
	Manatidæ; Manatee, Dugong, Steller's Rhytina.

SECOND GROUP—NON-PLACENTAL AND OVO-VIVIPAROUS MAMMALS.

Order XIII.—Marsupialia	*Phalascomydæ;* Wombat.
	Macropidæ; Kangaroos, Potoroo, Tree-Kangaroos.
	Phalangistidæ; Phalangers, Vulpine Opossum, Flying Phalangers, Koala.
	Peramelidæ; Bandicoot Rats.
	Dasyuridæ; Ursine Opossum, Phascogales, Banded Myrmecobe, Thylacine.
	Didelphidæ; American Opossums, Yapock.
Order XIV.—Monotremata,	*Ornithorhynchidæ;* Duck-bill.
	Tachyglossidæ: Porcupine Ant-eaters.

INTRODUCTION.

NATURAL HISTORY OF THE PRIMEVAL WORLD.

Before we enter upon an exposition of the fascinating science which teaches us the habits and structure of the various forms of animal life, arranges them in their several tribes and genera and species, points out their resemblances and differences, and determines their part in the grand economy of the universe; before, in a word, we proceed to a survey of the Animal Kingdom as it is now presented to our gaze, it is well we should inquire into its earlier history, and ascertain what facts we can respecting the past condition of its individual members.

The researches of modern geologists have revealed to us the fact that Earth was not always tenanted by the same forms of animal life, but that each age and period has possessed its own separate creation; each creation being, as it were, an advance upon its predecessor, and a further, and in some respects a grander, development of the Creative Power.

The naturalist who would fully comprehend the extent, beauty, and splendour of the science to which he has devoted himself, needs also to be a palæontologist; that is, he should be able to trace these successive developments from the tiny trilobites that inhabited the Silurian seas, to the mighty mammoth which prowled among the icy wastes of Siberia from the apparently shapeless medusa which floats like an inanimate jelly on the summer wave, to the exquisite organization and colossal structure of the Asiatic elephant.

We know that before our planet assumed its present configuration, it passed through a series of great and astounding changes, which have left their indelible records upon its surface and in its bosom. We know that these changes in the condition of the earth were accompanied by not less surprising changes in the characters of its then inhabitants. That such would be the case we might easily have presumed from our knowledge of the fact that all animals, even now, will not flourish under the same conditions; that while one genus seeks the dry and barren sands of the desert, another can only live among the marshes of an inundated coast; that while one basks in the warm rays of a tropical sun, another flourishes in the obscure twilight of the polar regions.

We are not, however, left to the mercies of philosophical speculation. The records of her past are securely preserved by Earth, and may be read at leisure by those who have eyes to see. The curtain that concealed them for so many centuries has been lifted, and in her rocks and fossils we may study the revolutions of millions of years. The palæontologist, therefore, pursues his investigations under singularly favourable circumstances. He is not left to surmise or guess; he has only to deal with patent and irrefragable facts, with certain and incontrovertible evidence. With equal eloquence and truth it has been said that the earth is a book written by the finger of God. Its leaves are those stratified rocks which—superimposed on one another in an ascending series—make up its crust, represent the duration of ages by their thickness, and the cataclysms of creation by their fractures. Its letters are the fossil remains of the plants and animals that lie ensepulchred in its womb; the permanent traces of volcanic eruptions, and slow-moving glaciers, and ever-lapsing waters; the faint but enduring footprints of the strange forms which once crawled over its soft mud; the ripple-marks of primeval seas, whose music has died away into the silence of a remote and mysterious past! All these hieroglyphics, says a recent writer, with which the stony leaves of the earth's great book are crowded, thick as the inscriptions on the buried bricks of Nineveh and the mummy caves of Egypt, have been deciphered with remarkable accuracy by the geologist. Not less significant are they to him than the trail of his enemy to the North American Indian, or the footprints of the camel to the Arab nomade of the desert.

"As the ancient civilization," remarks Mr. Macmillan, "of the great empires of Egypt, Nineveh, and Babylon, has been recovered to us, and pictured in nearly all its original grandeur and completeness, from the relics left behind in the mounds of Khorsabad and the temples of Memphis and Thebes, so from these remains of the pre-Adamite world we can reconstruct, in imagination, the successive scenery of its different epochs. Before the eye of fancy, at the spell of some fossil, or insignificant impression in a wayside stone, a combination of landscape scenery with which there is nothing analogous in the present condition of things, passes in review; and standing on this high vantage-ground of Time, we can survey, by the help of those landmarks placed here and there for our guidance, the whole history of our earth, the whole series of creations which one after another appeared and vanished!"

This series of creations, regarded from the naturalist or palæontologist's point of view, we now proceed to consider. The reader who follows us carefully in our necessarily brief but not the less accurate survey, will remark, with wonder and admiration, how they all lead up, by slow but certain steps, to the preparation of Earth for its last and greatest inhabitant—Man. He will see, moreover, a constant succession of forms of animal life rising from lower to higher organizations; not so much, it is true, by the law of development as by that of substitution. Yet he will observe, too, a certain measure of development. It may not be correct to say that the trilobite has developed into man, but it is certain that all man's parts and organs—to use Professor Owen's expression—have been "sketched out" in anticipation in the inferior animals. All those creatures which lived and died in the bygone ages of the primeval world lived and died in pre-ordained preparation for the embodiment of the "divine Archetype" in his precious "vesture of humanity." Thus, then, to the naturalist, Man must ever appear as the apex of creation, the most perfect form of animal life, the "centre of the universe of time."

PRIMARY EPOCH.

The first forms of life upon the surface of our planet would seem to have been vegetable; the earliest animal organisms belong to the SILURIAN PERIOD.* The earth was then covered with seas of no great depth, whose waters eddied round isolated rocks, or seethed over barren submarine reefs; rocks and reefs being clothed with flowerless Algæ, among which various species of Molluscs found an asylum and a provision.

These molluscs belonged to the group *Brachiopoda*, or arm-footed; a group with bivalve shells, differing in internal structure from most recent bivalve molluscs. In these the *mantle*, or *pallium*, consisted of two broad expansions or lobes, which shut in the soft body of the animal. The processes of respiration and aëration of the blood were carried on by the surface of the lobes, which were covered with a labyrinth of minute blood-vessels, and fringed along the edges with vibratory *cilia*. By means of the cilia the animal maintained a constant motion in the surrounding water, which provided it with the necessary supplies of fresh air. It procured its food through the agency of a singular apparatus; two long tremulous arms, which, proceeding from the sides of its mouth, were furnished with a host of filaments to entangle as in a mesh its prey.

Among the fossil remains of this period the genus Lingula is especially abundant. It is the only bivalve with a pedunculated shell; that is, the only bivalve able to attach itself to external objects by means of a hollow fleshy tube, called a *peduncle*. It had two long ciliated arms, like its congener, which it curled up during repose. Its shell was thin, with equal valves, of a horny or calcareous character, peaked at the apex, and generally open at the base.

This genus is represented in the islands of the Indian seas by several existing species.

In the Silurian strata, and, indeed, in all Palæozoic rocks up to the Triassic, are found numerous remains of a genus of molluscs which palæontologists have named *Orthoceras*, straight-horn. In many respects it is closely akin to that fairy-like tenant of the existing seas, the *Nautilus*, and might not inaccurately be described as a nautilus unrolled and stretched out straight. It has a straight shell, and its interior compartments are separated by thin partitions, and pierced by a cylindrical tube or siphuncle. According to the form and size of this siphuncle the Orthoceratites have been classified into certain sub-genera, including nearly 200 species. They are very widely distributed, and of all the palæozoic fossils are the most abundant. In the Silurian seas they lived a life of piracy and rapine, preying upon other animals, which they hunted into the profoundest recesses, and strangled in the tenacious grasp of their long arms.

The *Orthis* (straight) is a genus of fossil brachiopods, also found in the Silurian rocks, and including upwards of 100 species.

To the same period belongs the genus *Terebratula*, of which only one living species exist, but the fossil are more than 100 in number. The animal was attached to its smooth circular shell, which had a truncated and perforated beak, by a pedicle; and the animal itself consisted of a kind of slender, flattened, calcareous loop, with divergent pieces, and a ciliated appendage on either side. The shell is covered with minute perforations, and frequently ribbed in a very curious manner. It bears a general resemblance to that of the cockle, so plentiful on our British shores.

The only family of *Crustaceans* created in the Silurian period was that of the *Trilobites*, first described, upwards of a century ago, by Edward Lhuyd, then curator of the Ashmolean Museum at Oxford.

They appear to have moved only by swimming, and to have lived very near the surface of the water. When in locomotion they preserved an inverted position, with the belly upwards, and on the approach of danger immediately rolled themselves up into a ball, like the hedgehog. They haunted the vicinity of the low marshy coasts, where they lived gregariously in countless legions, feeding on the smaller water-animals. Burmeister, whose monograph on this order is remarkable for closeness of observation and lucidity of statement, considers their nearest type, in the present seas, to be the Entomostraceous crustacea known as the *Phyllapoda.*

Their body was covered with an ingeniously-jointed shell, in which, says Figuier, the mediæval armourer might have found all his contrivances anticipated, with not a few besides which his invention failed to discover.

The head was protected by an oval shield; the body composed of a certain number of rings or segments; the tail of many closely-fitted joints. The eyes were sessile and compound, and of remarkable magnifying power; the lens in one species, *Asaphus caudatus*, consisting of fully 400, and in another, *Asaphus tyrannus*, of at least 6000 facets. This extraordinary strength of vision was doubtless requisite to reveal to them the minute aquatic organisms on which they preyed.*

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* So called because the strata composing it were discovered on an extensive scale, by Sir Roderick Murchison, in that part of Wales formerly inhabited by the *Silures.*

* In reference to the eyes of the Trilobites, Dr. Buckland has some very just and interesting observations. He points out that the waters wherein they maintained their existence throughout the entire period of the Transition formation, could not have been that imaginary turbid and compound chaotic fluid, from the precipitates of which some geologists have supposed the materials of the surface of the earth to be derived; because the structure of their eyes is such, that any kind of fluid in which they could have been efficient at the bottom, must have been pure and transparent enough to allow the passage of light to organs of vision.

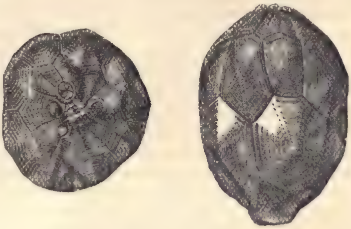
The mouth was placed forward and beneath the head. No antennæ or limbs have been recognized in any species; and it is probable their feet were simply soft, leaf-like appendages, carrying the gills, which, from their perishable nature, would leave no traces in a fossil condition.

The Trilobites varied greatly in size. While many were no larger than a pin's head, others—as the *Asaphus gigas*—were eighteen inches long. Upwards of 400 species have been determined. Of these forty-six are Silurian. They wholly ceased to exist after the Carboniferous epoch. Their structure is a beautiful example of the articulated type, and admirably illustrates that unity of design which is conspicuous through all the diversity of nature.

Many other orders of molluscs were abundantly represented in the primeval ocean of the Silurian period. Among the *Cephalopods* we may name the *Gyroceras* and *Lituites cornu-arietis*, or ram's horn, which, like the Orthoceras, were allied in many respects to our modern Sepia and Nautilus. The *Gasteropods* (belly-footed), so called because their locomotive apparatus is attached to the under part of the body, found a type in the genus *Bellerophon*, which, with their elongated transparent body and rudder-like fin, resembled the existing Carinaria, and inhabited the lowest depths of the sea. Several species of *Lamellibranchiata* (an order of Acephalous or headless molluscs) also existed: in these the shell consisted of particles of carbonate of lime, exuded from the surface of the mantle, and contained in the cellular cavities or between the membranous layers of the animal; the size of the latter being always proportionate to that of the shell.

Lituites cornu-arietis. One-third natural size.

Nor were specimens of the class *Radiata* wanting; the *Echinodermata* being represented by the *Hemicosmites* among other genera; all of which, like existing types, were distinguished by their possession of a hard coriaceous or leathery covering, a digestive and vascular system, locomotive organs, and sexual distinctions.


Hemicosmites pyriformis. One-third natural size.

"In this group," says Mr. Patterson, "we find animals of extremely dissimilar appearance associated together. One species is attached, for a certain period, to a stem, and resembles a polype, with its waving and sensitive arms. In the common star-fish, or 'five fingers,' we have the arms radiating from a common centre. In the sea-urchins there are no arms, and the form of the body is globular; and passing over some intermediate gradations of figure, we reach creatures which in external aspect resemble worms, and have even been classed as such. At one extremity of the range the Echinodermata remind us of polypes—creatures of inferior organization; at the other extremity they approach the annulose animals, whose structure is of a higher grade."

In these warm shallows of the Silurian ocean flourished also several species of *Pteropods* (wing-footed), *Heteropods* (paddle-footed), *Graptolites*, and *Cystidians;* all having sprung into life during the earlier times of the Silurian period. These, however, possessed no peculiar characteristics which call for a detailed notice; and we shall content ourselves with indicating, in the following summary, the general groups and classes of animals belonging to the lower (*i.e.*, the earlier) Silurian period, and the strata wherein their remains are found interred.

LAURENTIAN GROUP OF ROCKS.

Gneiss, Hornblende, and Mica-schists, ...	Foraminifera.*

CAMBRIAN GROUP.

Llanberis slates, and sandy strata, .	Annelides (worms).
Lingula flags, ...	Trilobites; Olenus; Conocoryphe paradoxides; Brachiopods; Cystideans.
Tremadoc slates, ...	Trilobites; Bellerophon; Orthoceratites; Theca.

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whose nature is so fully disclosed by the state of perfection in which they are preserved. With regard to the atmosphere of the then existing world, we may also infer that had it differed materially from its actual condition, it might have so far affected the rays of light, that a corresponding difference from the eyes of existing crustaceans would have been found in the organs on which the impressions of such rays were then received.

We may also learn, respecting light, from the resemblance of these most ancient organizations to existing eyes, that the mutual relations formerly existing between the eye and light were the same at the time when crustaceans gifted with the faculty of vision first flourished in the primeval seas, as at the present moment.

Hence it appears that among the earliest organic remains there existed an optical instrument of most curious construction, adapted to the production of a peculiar kind of vision. We do not find this instrument undergoing a series of experimental changes from more simple into more complex forms: we find it created at the very outset in the fulness of perfect adaptation to the uses and condition of the class of creatures to which this kind of eye has ever been and is still appropriate. (See Dr. Buckland's Bridgewater Treatise, *Geology and Mineralogy considered with reference to Natural Theology*, vol. i. pp. 401–403.)

* *Foraminifera*, a class of minute many-chambered shells, so called from their *perforated* partitions.

LOWER SILURIAN GROUP.

Quartzose sandstones and grits; argillaceous slates, ...	Trilobites; Graptolites; Heteropods; large Cephalopods.
Dark-coloured slates, calcareous flags, sandstones, ...	Do. do.
Shelly sandstones; conglomerate, and shales; Bala limestone, . .	Brachiopods; Lamellibranchiata; Pteropods; Cystideans; Graptolites; Trilobites.

UPPER SILURIAN PERIOD.

During the later ages of the Silurian period some new genera of fishes made their appearance in the shallow ocean. "The so-called fish-bones," says Figuier, "have been the subject of considerable doubt. Between the Upper Ludlow rocks, opposite the castle of Ludlow, and the next ascending stratum, occurs a thin bed of soft, earthy shale and fine, soft, yellowish greenstone, immediately overlying the Ludlow rock: just below this lies a remarkable animal deposit, called the Ludlow bone-bed, from its large deposits of the bones of animals." Long before geology acquired form and substance as a science, these bones attracted attention and excited curiosity. The old poet, Michael Drayton, refers to them in his *Poly-Olbion:*—

> "With strange and sundry tales
> Of all their wondrous things; and not the least in Wales,
> Of that prodigious spring (him neighbouring as he past),
> That little fishes' bones continually doth cast."

When Sir Roderick Murchison, who may justly be entitled the great historian of Siluria, first examined this deposit he found it to exhibit "a matted mass of bony fragments, for the most part of small size and of very peculiar character." These fragments were partly of a mahogany hue, and partly of so brilliant a black, as to convey the impression that the bed was a heap of broken beetles.

Professor Owen has given it as his opinion that among the remains may distinctly be recognized those of fishes. Other naturalists have controverted the professor's statement, which, however, is supported by Sir Roderick Murchison. Without entering into so vexed a question, we may turn to the consideration of those fossil relics which all observers have agreed in pronouncing of a Crustacean character.

The Trilobites, let us add, now attained their greatest development, as in the species *Calymene*, *Phragmoceras*, and *Ilœnus*.

The Silurian crustaceans were of a very curious form, not altogether unlike the existing prawn. They were inhabitants of the fresh waters, and endowed with extraordinary voracity. The Scotch quarrymen called them "Seraphim," from the winged form and feather-like ornament of the thoracic appendage.

The best known species are the *Pterygotus bilobatus* and the *Eurypterus*.

Now, too, first budded on the deep-sea rocks the innumerable members of the order *Crinoidea* or *Encrinites*, commonly called "Stone Lilies." "We may judge," says Dr. Buckland, "of the degree to which the inhabitants of these species multiplied among the first inhabitants of the sea, from the countless myriads of their petrified remains which fill so many limestone beds of the Transition formations, and compose vast strata of entrochal marble, extending over large tracts of country in Northern Europe and North America. The substance of this marble is often almost as entirely made up of the petrified bones of Encrinites as a corn-rick is composed of straws. Man applies it to construct his palace and adorn his sepulchre; but there are few who know, and fewer still who duly appreciate, the surprising fact that much of this marble is composed of the skeletons of millions of organized beings, once endowed with life and susceptible of enjoyment, which, after performing the part that was for awhile assigned to them in living nature, have contributed their remains towards the composition of the mountain masses of the earth."

The Crinoidean, or lily-shaped animal, is thus described by Hugh Miller:—"A round, oval, or angular column, composed of numerous articulating joints, supporting at its summit a series of plates or joints which form a cup-like body, containing the viscera, from whose upper rim proceed five articulated arms, dividing into tentaculated fingers, more or less numerous, surrounding the aperture of the mouth."

There are several varieties, but the two most conspicuous and beautiful genera are—

The *Encrinites*, with a circular stem, very closely resembling the external form of the lily; and

The *Pentacrinites*, which have a pentagonal stem.

The former genus belongs to the older rocks, but all its species became extinct before the Lias period, new groups succeeding, which, in our modern seas, are represented by only two types.

The animal lived in a fixed position, attached to the sea-bed or to some external object, moving itself in quest of food by bending forward or downward its flexible column. This column, or stem, consisted of numerous ossicula, *i.e.*, small bones, joints, or articulations, which, being perforated in the centre, may be strung together like beads. In our northern counties they are very frequently met with, and are commonly called "wheel stones," or "St. Cuthbert's beads." To the latter appellation Sir Walter Scott refers in his poem of "Marmion":—

> "On a rock by Lindisfarne
> St. Cuthbert sits, and toils to frame
> The sea-born beads that bear his name."

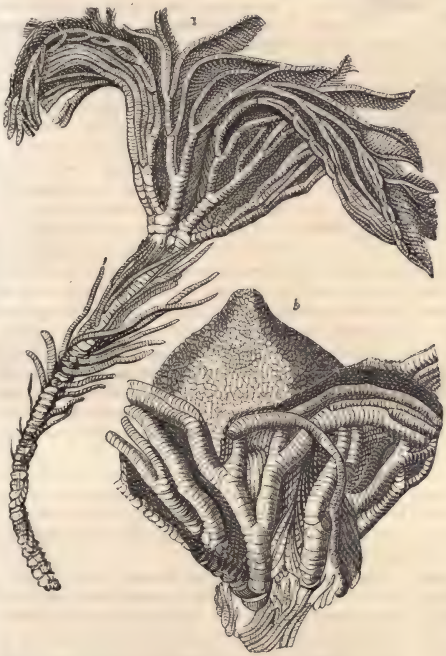
According to Dr. Mantell, they have been discovered in the barrows or tumuli of the ancient Britons, who appear to have used them as ornaments.

From the same authority we learn that the channel formed by the united ossicula of the column has originated the curious fossils called in Derbyshire *screw* or *pulley stones*, which are, in fact, flint casts of these cavities. They occur in the beds of chert interstratified with the mountain limestone; the siliceous matter, when fluid, filled up the channels and surrounded the stems: the calcareous substance has since been dissolved and removed, and solid cylinders of flint, resembling a pulley, remain. "In the quarries on Middleton Moor, near Cromford, where extensive beds of limestone, composed of crinoidal remains, are worked for chimney-pieces and other ornamental purposes, beautiful examples of these fossils may be obtained. The cavities of the column and ossicula are often filled with white calcareous spar, while the ground of the marble is of a dark reddish-brown colour."

Thus, then, the marble which now adorns our habitations was elaborated, ages ago, by countless myriads of ocean's living flowers—those rare and beautiful organisms whose principal living representative is the *Pentacrinus caput Medusæ*, an inhabitant of the genial waters of the Caribbean Sea.

The chief species of the Crinoideans found in the Silurian strata are:—*Encrinus liliformis*, *Dimencrinites decadactylus*, *Cyathocrinites gonodactylus*, *Hypanthocrinites decorus*, and *Cupressocrinus crassus*.

The advent of coralline animals also belongs to the period we are now considering. Of these, however, we shall speak hereafter. A line of reference must be given to the genus *Euomphalus*, so named in allusion to the deeply umbilicated, or navel-like, depression of its disc. The animal inhabited an univalve shell, divided internally into several chambers. As it grew in size, it abandoned the innermost chamber, which served it for an asylum, leaving it vacant, and secreting behind itself a partition wall. This operation was repeated at each successive stage of its growth, so that the animal and its house expanded simultaneously.



a, Pentacrinites Briareus, reduced; *b*, the same from the Lias of Lyme Regis, natural size.

The fishes belonging to this period have been classified under a genus named *Sphagodus*, or murderous tooth; they were, undoubtedly, the pirates of the Silurian seas, whose ravages confined within reasonable limits the increase of the lower organisms.

We tabulate, as before, the rocks and fossils of the

UPPER SILURIAN PERIOD.

Rocks.	Fossils.
Hard sandstone, slates, and conglomerate beds, ...	Crinoideans and Corals.
Calcareous sandstone, coarse grits, and purple shales, ...	Brachiopods.
Limestone and shales, felspathic sandstone, grit, argillaceous shales, and concretionary and thick-bedded limestone, ...	Marine molluscs; Radiata; Trilobites; Graptolites.
Shale, with calcareous limestone, .	Marine molluscs.
Argillaceous limestone, ...	Crinoideans.
Micaceous grey sandstone, and mudstone, ...	Crustaceans; Fish of the *Sphagodus* genus.

THE DEVONIAN PERIOD.

We now come to an investigation of the natural history of the Devonian, or Old Red Sandstone, so called because the formation is very largely developed in the county of Devon.

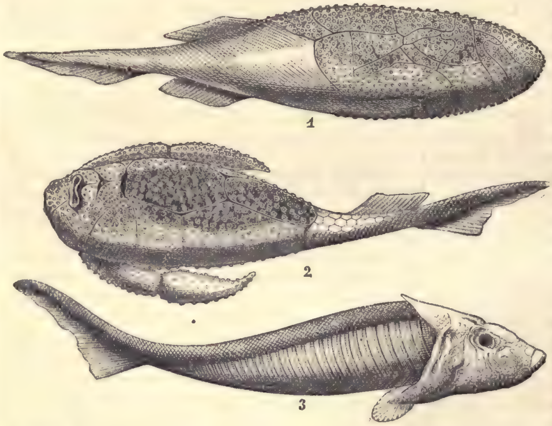
The seas were still of vast extent, but their surface was diversified by scattered islets, on whose rocky shores the Mollusca and Articulata of the period passed through their various stages of existence. Here the lily-like Encrinites still bloomed and flourished; on the sandy shore burrowed enormous annelids, large as a man's arm; the eurypterus still paddled through the teeming waters; and throngs of strange ganoid fishes fluttered to and fro, in quest of food or in flight from an enemy.

The fishes were, perhaps, the most conspicuous members of the Devonian fauna. Uncouth were they of form, and widely different from any of the species which inhabit our present seas. Many were shut up in a complete armour of bony plates; others glittered with strange coats of hard enamelled scale; not a few were furnished with fin-spines and other external weapons of attack and defence. So curious and unusual was their conformation that early observers not unfrequently set them down as crustaceans, reptiles, or even "huge water-beetles."

Take, for example, the *Coccosteus*, which may be described as a half-armoured or partially plated individual, only the upper part of the body down to the fins being protected by scales. It derives its scientific name ("berry-bone") from the small berry-like projections or tubercles which studded its plated surfaces.

Still more remarkable in aspect was the *Pterichthys*, or Winged Fish, whose fossil remains were first discovered by Hugh Miller. His description of this apparently monstrous anomaly, which nevertheless was admirably fitted to discharge its peculiar functions in the economy of creation, will interest the reader. Imagine, he says, the figure of a man roughly drawn in black on a grey ground, the head amputated at the shoulders, the arms extended as in the attitude of swimming, the body rather long than otherwise, and narrowing from the chest downwards; one of the legs cut away at the hip-joint, and the other, as if to preserve the balance, placed directly under the centre of the figure which it seems to support. Such, at a first glance, is the appearance of the fossil in its sandstone bed.

The body was of very considerable depth, perhaps little less deep proportionally from back to breast than the body of the tortoise; the under part was flat, the upper rose towards the centre into a roof-like ridge, and both under and upper were encased in a strong armour of bony plates, which, resembling those of the tortoise more closely than those of the crustacean, received their accessions of growth at the sutures or edges.



Fishes of the Devonian epoch. 1, Coccosteus, one-third natural size; 2, Pterichthys, one-fourth natural size; 3, Cephalaspis, one-fourth natural size.

On the under side the plates are divided by two lines of suture, which run, the one longitudinally through the centre of the body, the other transversely, also through the centre of it: they bisect one another at right angles, but a lozenge-shaped plate intervenes at the point of bisection.

There are thus five plates at the lower or belly part of the animal, all thickly tuberculated outside with wart-like protuberances; the inner present appearances indicative of a bony structure.

The plates on the upper side are more numerous and less easily described; just as it would be difficult to particularize the forms of the various stones which compose the ribbed and pointed roof of a Gothic cathedral; the arched ridge or hump of the back requiring, in a somewhat similar way, a peculiar form and arrangement of the plates.

A stout plate, of hexagonal form, covers and protects the apex of the ridge, like a skull-cap or helmet; and nearly corresponds in position to the flat central part of the under side. Around it runs a border of variously-formed plates, diminishing in size and increasing in number towards the head, and separated, like the different portions of a dissected map, by deep sutures. All present a tuberculated surface. The eyes are fixed in front, on a prominence much lower than the roof-like ridge of the back. As in many other fishes, the mouth seems to have opened in the edge of the creature's snout, where a line traversing the back would bisect a line traversing the belly. The two arms or paddles are placed so far forward as to give the body a disproportionate and decapitated appearance. From the shoulder to the elbow, so to speak, occurs a swelling muscular projection, as in the human arm; the part below is flattened so as to resemble the blade of an oar, and terminates in a strong sharp point. The tail is of considerable length, more than equal to a third of the entire figure, and of an angular form—the base representing the part attached to the body, and the apex its termination. It was clothed with small tuberculated rhomboidal plates, like scales; and where the internal structure is shown, appearances may be seen of a vertebrated bone, with rib-like processes standing out at a sharp angle.

From this life-like description the reader will readily image to himself the actual aspect of the Pterichthys. Its jointed arms, or paddles, were employed in swimming; and its speed, combined with its defensive armour, must have rendered it a formidable denizen of the Devonian seas.

The *Cephalaspis*, or Buckler-head, bore a considerable resemblance to the fishes of the present time. It was protected only on the anterior part of the body; its head-plate consisting of a single piece, shaped like a shield, whence its scientific appellation.

Other fishes of the period were undefended by any such armour as that which we have described, but the strong resisting scales that enveloped the whole body afforded, nevertheless, a considerable protection. Such were the *Acanthodians*, whose fins were armed and supported by sharp spiny bones; the *Climatius;* the *Diplacanthus;* the *Dipterus*, or double-finned; the *Osteolepis*, or bony-scale; the *Holoptychius*, or all-wrinkle, so named in allusion to the curious wrinkle-like engraving on its large enamelled scales; and the *Asterolepis*, or star-scale.

The head of the latter was encased in bony plates, fretted with star-like tubercles (whence the name); and its body was covered with bony scales, not less beautifully sculptured than the marbles of Nineveh. Even the elaborate carvings of Benvenuto Cellini seem rude and unfinished compared with those which fretted the armour of this inhabitant of the Devonian ocean. It was a fish of large size, equalling in that respect, and sometimes surpassing, a large porpoise. Its vertebral column is supposed to have been cartilaginous, like that of the sturgeon; its teeth partook of the characters both of the fish and the reptile classes—the outer row being thickly set, as in the fish, while the inner was thinly set, as in the reptiles.

In reference to these species, however, Dr. Page observes that their forms would not startle us, notwithstanding their apparent singularity, though they were suddenly restored to take their places among existing fishes. He reminds us that the little armed bullhead of our British shores wears an armour as marvellous as, and even more enriched than, that of the *Cephalaspis.* The *Ostracion*, or trunk-fish of the Indian Ocean, is encased in a bony box as strangely fabricated as that of the *Pterichthys* or *Coccosteus.* Not less formidable weapons are the spines of the balistes and sea-snipe than the ichthyodorulites of the *Diplacanthus;* and the scales of the bony pike of South America gleam with as bright an enamel, and exhibit as quaint a sculpturing, as those of the *Osteolepis* or *Holoptychius* of the old red sandstone.

In the Devonian fauna a very important place was held by the Crustacea, and among the Crustacea by a family named the *Eurypteridæ,* which in some respects resembled our existing king-crabs, as in their carapace and organs of digestion; in others, our present lobsters, as in their prolonged and segmented bodies. They were furnished with "broad, paddle-like, swimming limbs," and frequently with huge prehensile claws; measured from three to six feet in length; and acted as the scavengers of the Devonian coasts. In the same beds with these Crustacea have been discovered an immense number of "dark-coloured patches of spawn-like organisms," which palæontologists are now agreed in regarding as the ova or spawn of the *Eurypterus* and the *Pterygotus*, and which bear signal testimony to the ancient abundance and prolificness of crustacean life.

It is generally admitted that in the Devonian period the order of reptiles first made their appearance, though we have no certain evidence of their existence. Reptilian foot bones and relics have, indeed, been found in the Elgin sandstones, but some geologists are of opinion that these sandstones do not belong to the Devonian, but to the early Triassic formation. As the question is of a doubtful character, we shall defer to the newer era our consideration of the *Telerpeton* and the *Staganolepis*, though these reptiles are usually treated in connection with the old red sandstone.

"Such," we may say in Dr. Page's well-considered words, "is a cursory glance at the life of the Devonian epoch. As yet we know scarcely anything of its terrestrial flora and fauna. We are like voyagers to whom some unknown land looms in the distance through the sea-fogs and grey of the morning. Here and there a few gleams of light fall on hill-sides green with ferns and club-mosses; and as the mists roll away we catch a passing glimpse of some river-mouth fringed with reeds and rushes. This, however, is all; the interior is obscured from our vision, and no drift of fruit or forest-growth tells of a higher flora. As we coast along we almost think we catch the reflection of glacier and icebergs, which would indicate in some regions a sterility and dearth of vegetation; but this may be a delusion, and only the sparkle of the quartzy cliffs that are broken into fragments by the surf that dashes against them. When we turn to the ocean, the view is somewhat nearer and clearer. In the warmer seas corals of various forms and beauty are rearing their reefs; shell-fish of every grade, though not of great numerical abundance,* are busy along shore and in mid-water; fishes of widely different forms swarm in shoals, generically few, but individually most numerous; while crustaceans of uncouth shape and gigantic growth feed on the tide-borne garbage of the muddy creeks and shallow lagoons. This is all; and much as has been made of it, all reason forbids us to accept it as more than the merest contribution to the biology of the period."

Our investigations into the natural history of the primeval world now bring us to the

CARBONIFEROUS PERIOD,

which is generally subdivided into two great sub-periods:

1. The *Carboniferous Limestone.*
2. The *Coal Measures.*

To the former the earth owes some of its most important marine deposits; to the latter those enormous treasures of coal which have been so intimately connected with human progress and the development of civilization.

The limestone deposits which underlie the coal system, and which in many places attain a thickness of 2500 feet, are of marine origin; have sprung from the death and decay of innumerable myriads of zoophytes, radiata, cephalopods, fishes, and reef-building corals. The seas then teemed with life. Whole strata are now composed of the calcareous remains of extinct genera, which once trailed along the sands, or clung to the weedy rocks, or crawled along the marshy shore, or floated in the mid-depths of ocean. The Encrinites were then so abundant that entire masses of limestone are composed of their fossil relics, just as islands of coral consist of coral animals. Nor were shell-fish less plentiful. *Orthoceratites*, a yard in length, and *Bellerophons* of extraordinary size, flourished in the warm and genial waters, which also fed and supported legions of star-fishes (*Pentrenites*), sea-urchins (*Palæchini*), *Serpulæ*, and *Spirorbes.*

Beds of limestone occur in the weald-clay of Sussex, which are wholly made up of the univalve called *Paludina.* This was a fresh-water snail, which lived in the rivers and lakes of the Carboniferous period. Sometimes the shells are found wholly decomposed, and their casts alone remain, the interstices being filled up with calcareous deposit or indurated marl. In the coarser varieties are cavities left by the decomposition of the shells; in the compact masses the whole has been permeated with a crystalline calcareous infiltration, of various shades of grey, blue, and ochre, interspersed with pure white. But other animal remains enter into their composition, which the naturalist cannot fail to regard with interest. These belong to a fresh-water crustacea, called *Cypris,* which still swarms in our pools and stagnant waters, and resembles a flea covered with an oval shield, except as to the head and feet. It swims by means of numerous cilia, which are fine as pencils of hair. Its shield, shell, or case it sheds annually; and though its natural size does not exceed that of a pin's head, yet in certain formations huge layers of stone, massive rocks, are composed of the consolidated remains of various species of *Cyprides*, while they also constitute a large proportion of the mass of many beds of Sussex marble.

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* Here we venture to differ from Dr. Page. The species or genera were not numerous, but of the abundance of shell-fish in certain species we entertain no doubt.

Contemporary with the crustaceans and molluscs now described was the *Megalichthys*, a genus of Sauroid fishes, established by the researches of Agassiz. Their teeth equalled in size the teeth of the largest living crocodiles: in external form nearly conical, they were perforated by a conical cavity, like that within the teeth of many lizards; the base was fluted, like the base of the teeth of the *Ichthyosaurus*. Their immense size is a proof of the magnitude which fishes of this family attained at a period so early as that of the Carboniferous formation. The object of so formidable an apparatus seems to have been, not for mastication, but to enable these voracious fresh-water rovers to hold fast and swallow the slippery bodies of the fishes on which they preyed.

Seventeen genera of Sauroid fishes have been distinguished by Agassiz, whose only living representatives are the genus *Lepidosteus*, or Bony pike, and the genus *Polypterus;* the former inhabiting the great rivers of North America, and the latter the Nile of Egypt, and the Senegal of West Africa.

Another genus of fishes belonging to the Carboniferous formations was the *Amblypterus*. From the character of their teeth it is evident that they fed upon decayed sea-weed, and on such soft animal substances as they found at the bottom of the water. The teeth are small and numerous, and set close together like a brush. The form of the body shows that the *Amblypterus* was incapable of rapid progression. The vertebral column is prolonged into the upper lobe of the tail, which is much longer than the lower lobe, and thus was ingeniously adapted to sustain the body in an inclined position, with the head and mouth nearest to the bottom.

Among existing cartilaginous fishes we find the same prolongation of the vertebral column into the caudal fin occurring as a distinctive characteristic of the sturgeon and the shark. The former is one of the scavengers of nature; clearing the ocean and river waters of impurities with its soft, leather-like mouth, which was capable both of protusion and contraction, and feeding wholly on soft animal substances and putrid vegetable matter. Hence it has constant occasion to keep its body in the same inclined position as the fossil *Amblypterus*.

The marshy river banks and stagnant forest pools of the Carboniferous period were inhabited by certain forms of animal life which foreshadowed the frog and lizard of our own times. Of these some were wholly aquatic in their habits, some were arboreal, and others amphibious. To the first belonged the *Parabatrachus*, or frog-like reptile; to the second class, the *Dendrerpeton*, or tree-lizard; to the third, the *Archœogosaurus*, or ancient land-lizard. Professor Owen discovers in these early reptiles, with their vertebral column, gill-arches, and large throat-plates, a "linking and blending together" of the piscine and sauroid groups, in anticipation, as it were, of those huge labyrinthodont reptiles of which we shall have occasion to speak hereafter. Thus we find each form distinct and perfect in itself, and admirably adapted for its special functions, but each presenting itself as the type of some higher and more advanced form, to make its appearance when the earth was duly fitted for its reception.

In the accompanying illustration (Plate 1) our artist has endeavoured to realize a landscape of the Carboniferous period; some such picture as would have been presented to the eye of man, had man then lived. It is thus that imagination, aided by scientific knowledge, is enabled to re-create the past; it is thus that the philosopher, like the poet, can "give to airy nothings a local habitation and a name;" can fill up the imperfect outline with glowing colours, and clothe a barren world with life and vigour. Geology supplies us with the foundation on which, as naturalists, we build up the wondrous structure. We know that to certain conditions of our globe belonged certain organisms, certain forms of animal life; that those forms and those organisms could only flourish while the earth preserved a certain temperature, and exhibited a certain characteristic vegetation. The view, then, which we set before the mind's eye may be ideal, but it is not fictitious; in its general features, if not in its particular details, it will be unquestionably correct.

During the Carboniferous period a tropical heat must have prevailed over our world. There would be long days of burning sunshine, followed by glorious cloudless nights, "clad in the beauty of a thousand stars." There would be heavy dews, descending in the darkness, like pearly mists, to fertilize and refresh the thirsty soil. There would be torrents of appalling rains, accompanied by terrible electric discharges, forked lightnings, and the sound of rolling thunder. The globe at this epoch was probably one vast archipelago; the waters everywhere dimpling round the shores of ferny islands; or if any larger tracts of land existed, we can fancy them intersected by broad rivers, whose banks were hung with luxuriant forests, and whose interior was occupied with far-spreading marshes. Under the shade of tall trees, and arborescent ferns taller than our tallest oaks, throve an infinite variety of aquatic plants, equiseta, and club-mosses; and in every dell and hollow waved the fronds of the most gorgeous and magnificent ferns. Lilies gleamed among the dense rank grasses; rich, rare heaths adorned the open downs with their delicate hues; and many a pillar-like palm reared its crest of fan-shaped leaves in the warm glow of a cloudless sun. We are told of one strange plant, named the *Sphenophyllum*, which resembled an immense asparagus, twenty-five to thirty feet in height. Stigmaria and sigillaria attained to proportionally gigantic dimensions. All vegetation, terrestrial and marine, was on a colossal scale; we have nothing now to compare with it except the luxuriant and lofty growth of the virgin forests of the Brazils.

The general character of this vegetation will be understood from the following tabular classification:—

Dr. Lindley.	Brongniart.	Natural Families.
I. Thallogens.	1. Cryptogamous amphigens, or cellular cryptogams.	Lichens, sea-weed, fungi.
II. Acrogens.	2. Cryptogamous acrogens.	Club-mosses, equiseta, ferns, lycopods, lepidodendra.

III. Gymnogens.	3. Dicotyledonous gymnosperms.	Conifers & cycads,
IV. Exogens.	4. Dicotyledonous angiosperms.	Compositæ, leguminosæ, umbelliferæ, cruciferæ, heaths.
V. Endogens.	5. Monocotyledons.	Palms, lilies, aloes, rushes, grasses.

A recent writer has attempted to describe a carboniferous forest. The grass would be composed, he says, of herbaceous ferns and mare's-tail—a lacustrine vegetation shaded by the boughs of lofty trees. Here would tower a huge lepidodendron, with naked leafless trunk, and there a sigillaria, with a stigmaria at their foot, stretching its long roots covered with reproductive spores into the muddy, reeking waters. Numerous sphenophyllums raise their graceful pyramidal-shaped masses, terminating in a bud not unlike the cabbage-palm. All this rich, vegetable growth, under the influence of a hot sun and heavy rains, is constantly decomposing, and so gradually forming a rich, fertile *humus* or mould, to provide for the development of an entirely new generation of plants in a succeeding age.

From their partial decomposition were also being produced vast stores of fuel for the future benefit of the coming Man. These great forests, these wide tracts of ferns and grasses, were the origin of coal. At first the submerged plants would be a light spongy mass, resembling very closely the peat-moss of our northern moors and marshes. While under water these underwent a partial decomposition—a fermentation, whose different chemical phases, we are told, cannot be exactly defined. It is certain, however, that this decomposition and fermentation of the peat-mosses of the primeval world was accompanied by the production of considerable quantities of carburetted hydrogen, either in a gaseous or a liquid form. Thence result the hydrocarbon with which all coal is impregnated, and the tar oils which have penetrated the bituminous schists. "This emission of bicarburetted hydrogen gas," says M. Figuier,* "would probably continue until after the peat-beds were buried beneath the strata eventually deposited upon them. The mere weight and pressure of the superincumbent mass, continued at an increased ratio during successive ages, have given to the coal its characteristic density, and its state of aggregation."

But though, owing to the wonderful luxuriance of vegetation then prevailing, the greater portion of our coal-beds seem to have been formed in the period we are now describing, we must remind the reader that they have also been found in other formations, as in the oolite, the wealden, and the tertiary. In truth, as Dr. Page has justly remarked, coal is the product of every period, because it is simply the mineralized result of vegetable accumulation, and that accumulation is due to immensity of time rather than to rapidity of growth.

The difference existing in the mineral characters of various kinds of coal is partly attributable to the amount of pressure, and partly to the greater or lesser heat given out by the central fires of the earth. The inferior beds are invariably drier and denser than the upper ones, or less bituminous, because "their mineralization, so to speak, has been completed under the influence of a higher temperature, and, at the same time, under a greater pressure."

It may be of service to the reader if we here introduce an estimate of the

AREA OF THE COAL MEASURES OF THE WORLD.

	Square Miles.
North America (chiefly in the United States),	310,500
Great Britain,	6,200
France,	1,550
Rhenish Prussia and Saarbrück,	1,550
Belgium,	775
Bohemia,	620
Westphalia,	590
Spain (in the Asturias),	310
Russia,	160
Saxony,	66
New Zealand, Polynesia, and East Indian Islands,	Unknown.

These considerations have led us to digress from our more immediate subject of the landscapes of the Carboniferous period, though indirectly connected with it, and, in fact, of essential service in illustrating their general characters.

In the accompanying illustration some of the more remarkable species of animal life which inhabited the warm carboniferous ocean are represented. On the right a tribe of polypi sparkle with reflections of silvery lustre, the species nearest the margin being the *Lasmocyathus*, the *Chætetes*, and the *Phytopora*. The mollusc which occupies the extremity of the elongated conical tube, resembling the sheath of a Turkish sabre, is an *Aploceras*. It seems to be the rudimentary form of an ammonite: coil this elongated shell around itself, like a coil of bell-wire, and you would have at once before you the ammonite or the Nautilus. Nearly in the centre, reposing on the ocean-bed, are a *Bellerophon hiulcus*, a *Nautilus Koninckii*, and a *Productus*, the latter easily recognized by the numerous spines which surround its shell.

Other polypi are spreading out their greedy tentacles on the left. The Chonetes rise to the surface, furnished with small spines. You may distinguish the Cyathophyllum by their straight cylindrical stems; and some encrinites, or stone-lilies, winding round the trunk of a tree, or reposing their flexible stems upon the water. Among all this varied and characteristic life, immovably attached, for the most part, to the rocks on which it has first budded, move various fishes of the *Amblypterus* genus.

The teeming waters ripple on the low shores of many a pleasant island, most of them covered only with a dwarf rank vegetation, but others with vast forests of fern-trees and cycads, stigmaria and sigillaria, deficient in bud and bloom, but richly adorned with light, symmetrical, feathery fronds. "The trunks of a modern forest are rough and gnarled; those of the Carboniferous period sprung up like the sculptured shafts of a mediæval temple, graceful in proportion, and rich in ornament through the endless repetition of flutings, spirals, zigzags, lozenges, ovals, and other geometrical designs—these designs being the persistent leaf-scars of a vegetation simpler in structure and more primitive in plan."

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* Figuier: The World Before the Deluge.

THE PERMIAN PERIOD.

The Permian period was not remarkable for the introduction of new forms of animal life. Its principal features were the swift decadence of the luxurious flora which had embellished our earth during the gradual formation of the coal measures, and the upheaval of lofty highlands, of hills, and steep banks, which contracted the broad river estuaries and wide-spreading lakes within more moderate limits. Dome-shaped eminences of porphyry and syenite were raised on the earth's surface. Vast columns of steam and vapour rose from the midst of the sea, and condensing in the cooler atmosphere, fell in heavy torrents of rain. The evaporation of water on so extensive a scale was accompanied by an equally extensive disengagement of electricity, which illuminated the grey shadows of the world with incessant flashes of brilliant lightning, while over the boiling sea rolled peal upon peal of reverberating thunder. The Permian ocean, it is unquestionable, overspread an immense area of the globe. It stretched from Ireland to the Ural mountains, and probably to Spitzbergen, while its northern boundary would be defined (as geologists tell us) by the Carboniferous, Devonian, Silurian, and igneous regions of Scotland, Scandinavia, and Northern Russia; its southern limits apparently extending far to the south of Europe. "The chain of the Vosges, stretching across Rhenish Bavaria, the Grand Duchy of Baden, as far as Saxony and Silesia, would be under water. They would communicate with the ocean which covered all the midland and western counties of England and part of Russia. In other regions of Europe the continent varied little since the Devonian and Carboniferous ages. In France the central plateau would form a great island, which extended towards the south, probably as far as the foot of the Pyrenees: another island would consist of the mass of Brittany. In Russia the continent would have extended itself considerably towards the east: finally, it is probable that at the end of the Carboniferous period the Belgian continent would stretch from the departments of the Pas-de-Calais and Du Nord, in France, and would extend up to and beyond the Rhine."

The Permian formation is usually divided by geologists into three series of strata:—

The New Red Sandstone (the lowest);
Magnesian Limestone, or Zechstein (next in order); and
Permian, or Sandstone of the Vosges (uppermost).

The fossil remains of the new red sandstone, which attains a thickness of from 300 to 600 feet, and is found over great part of Germany, in the Vosges, and in England, are very few.

The dark schist beds of the magnesian limestone, which both in England and Germany attains a thickness of about 450 feet, are remarkably rich in the memorials of peculiar genera of fishes.

The Permian strata, which also occur in England, and in the government of Perm, in Russia (whence their name), on a very extensive scale, are characterized by scattered evidences of past organic life.

The principal points to which the attention of the naturalist may here be directed are:—

Certain forms of Sauroid fishes, as the *Palœoniscus* and *Platysomus;*

Labyrinthodon restored. One-twentieth natural size.

The Labyrinthodont reptiles;
The Bird-like and Reptilian footprints (*Ichnites*) on the new red sandstone; and
The first appearance of Mammalian life, under a marsupial form, in the *Dromatherium.*

In the *Palœoniscus*, the *Platysomus*, and other fishes of the Permian period, we find the upper tail-fin much longer than the lower, the vertebral column being continued in the upper caudal lobe, as in the *Amblypterus* of the coal measures, and the sturgeon and shark of existing seas. This arrangement Agassiz calls "heterocercal." These genera, in all probability, lived in the shore-waters, and never ventured far out into the wide ocean.

The Labyrinthodon.—Geologists were moved to wonder some years ago when they discovered the impressions of the foot of a strange animal in the new red sandstone—impressions closely resembling the marks that would be made in soft clay by the outstretched fingers and thumb of the human hand.

It was evident from their form that they were much too short for the feet of crocodiles, or any other known Saurians; and that they more probably belonged to some species of the *Testudinata*, or Tortoises. But the head, pelvis, and scapula of the animal being afterwards found, it was pronounced to be a huge air-breathing reptile closely connected with the Batrachians, an order now represented among us by frogs, toads, and water-newts. In Japan, however, a gigantic species still exists, called the *Sieboldtia;* but if a giant compared with the croaking inhabitants of our English marshes, it was a dwarf contrasted with the new red sandstone monster.

Judging from the impressions of its hand-like feet, Dr. Kaup, one of their early discoverers, considered it to be a marsupial animal, and named it *Cheirotherium;* but its Batrachian affinities have been determined by Professor Owen, who, in allusion to the complex structure of its teeth, christened it the *Labyrinthodon.* These teeth were situated both on the proper jaw-bones, and on the bone of the roof of the mouth called "vomer." The head was not naked, but defended by a bony cushion, and attached to the neck-bones by two joints. Its two fore feet were larger than its hind feet; the former seem to have been twelve inches long, the latter eight inches long by five inches wide. There were five toes, of which the first or great toe was bent inwards like a thumb. Each toe was armed with a nail. Its hind legs were much longer than its fore legs, in which respect it resembled the Batrachians; but its head and teeth were more like those of a shark. Altogether it was an uncouth-looking animal, but must have been singularly agile in its movements, capable of astounding leaps, and endowed with peculiar voracity.

The historian or the antiquary, says Dr. Buckland, commenting on these strange footprints on the sands of time, may have traversed the fields of ancient or of modern battles; and may have pursued the line of march of triumphant conquerors, whose armies trampled down the most mighty kingdoms of the world. The winds and storms have utterly effaced the fugitive impressions of their devastating course. Not a trace remains of a single foot, or a single hoof, of all the countless millions of men and beasts whose "storm-march," resistless and unresting, spread desolation over the earth. But the reptiles that crawled upon the half-finished surface of our infant planet, while its plastic substances were still being moulded into shape and form by the divine hand, have left on record the eternal and indelible memorials of their existence. No pen of poet or historian has told of their creation or destruction; their very bones are found no more, or only partially and rarely found, among the fossil treasures of the primeval earth. Thousands of years have passed away, and the world has undergone convulsion after convulsion, since the remote age when these footprints were first engraven on the yielding sand; yet there they are now, distinct and clear, exposed to our curious and wondering eyes, and stimulating our minds to dwell upon the wonders of an almost forgotten past. There they are now, stamped upon the rock, as legible as the recent track of man or animal in newly-fallen snow; there they remain, as if in proof that thousands of years are but as a link in the grand chain of eternity; as if in mockery of the transitory character of the heroes and heroic achievements of mankind.

Ichnites.—The consideration of these fossil footprints, or Ichnites, has become a distinct section of Palæontology, to which the name of Ichnology has been given. Our knowledge of many extinct animals wholly depends on the more or less distinct traces of their passage which have been discovered on the rocks which once formed the plastic sands or mud of the sea-shore or the river side. They are not numerous, however, in sandstone; most generally they occur in rocks originally deposited as mud, or in argillaceous beds lying between an upper and under sandstone layer. We may suppose, therefore, that anciently the bed of mud or clay formed an extensive level shore, exposed by the receding tide. Across this shore passed the primeval animals, and their footprints were immediately baked and hardened by the influence of a tropical sun. When the waters again came up, they would deposit a thin layer of sediment, which would be augmented by every successive flow of the tide, until the footprints were securely protected from any accident whatever. It is clear that this process would be most effectual in localities only submerged at spring-tides; and in this very manner, as Sir Charles Lyell tells us, the impressions of numerous wading-birds are preserved, at the present day, in the plastic mud which covers the flat shore of the Bay of Fundy, where the tide sometimes rises sixty and seventy feet.

Another method of preserving the impressions would be independent of the solar influence, as where, on an ordinary muddy shore, during the ebb of the tide, the footprints were filled up with blown sand, and the waters, on their return, overspreading the level, deposited upon it a fresh stratum of silt.

In one or other of these fashions, certain animals of the primeval world have been enabled to transmit to us these curious memorials of their existence; and we can trace the sinuous wriggling progress of various species of Annelids, the crawling movements of huge Crustacea, the slow heavy track of immense Chelonians, the jerking motions of vast Labyrinthodonts, besides the various processions and retrocessions of other reptiles and animals, engaged in their daily task of purification and destruction. Who can contemplate without emotions of awe, wonder, and admiration, this vivid testimony of the rocks to the plenitude of Creative Power? Who can read these records of the ages without a sense of divine grandeur as compared with human impotence? The footprints endure in the muds and sands of a half-finished world, when Tadmor is a howling waste, and of all the mighty civilization of ancient Egypt only a few shattered pillars and ruined temples remain!

The Dromatherium.—The earliest terrestrial Mammalia as yet discovered are of the marsupial order; small pouched animals allied to the existing opossum. It was generally considered that these did not make their appearance on our globe until the Oolitic period; but American geologists believe that they have found the fossil remains of a species, to which they have given the name of *Dromatherium silvestre,* in the new red sandstones of North America.

All the existing genera of the marsupial order, both herbivorous and carnivorous, are now peculiar to North and South America, and to New Holland, with the adjacent islands. The name *Marsupialia* is derived (as we shall hereafter more fully explain) from the presence of a large external marsupium, or pouch, attached to the abdomen, wherein the fœtus is placed after a very brief period of uterine gestation, remaining suspended to the nipple by its mouth, until sufficiently matured to come forth to the external atmosphere.

This order occupies an intermediate place between oviparous and viviparous animals. Hence it naturally formed a link between the Reptiles and the Mammals.

It is interesting to observe, as Professor Owen remarks, that the Marsupials present a very complete series, adapted to the assimilation of every form of organic matter; and no doubt they possessed a sufficiently powerful instinctive precaution to preserve themselves from extermination, when surrounded with enemies of no higher intellectual capacity than the Reptilia.

The Permian period closes what may be called the Primary Epoch of our world, when it was appropriated chiefly to animals living in the waters, and, especially, to crustaceans and fishes. As we have seen, the forms of the Reptilia were few in number, and of the Mammalia only one genus had appeared. We now arrive at the Secondary Epoch, which, before all things, was the epoch of reptile life.

ANIMAL LIFE IN THE SECONDARY EPOCH.

The Secondary Epoch is subdivided by geologists into three periods:—1. The Triassic; 2. The Jurassic; 3. The Cretaceous.

THE TRIASSIC PERIOD.

The Triassic period is so named because the rocks of which it is composed, and which are more extended in Germany than in England or France, were denominated the trias or triple group by German writers. They form, in fact, three groups, which, in ascending order, are as follows:—

England.	France.	Germany.
Sandstone and quartzose conglomerate.	Gres bigarré.	Bunter sandstein.
. . . .	Muschelkalk, or Calcaire coquilier.	Muschelkalk.
Gypseous shales and sandstone.	Marne irisée.	Keuper.

New Red Sandstone.—In this new phase of the revolutions of the globe, says a recent writer, the animated denizens of its surface differ greatly from those summoned into existence during the Primary Epoch. Those curious crustaceans, the Trilobites, have disappeared; the Cephalopods and Brachiopods have dwindled in numbers; the ganoid and placoid fishes gradually decline, and finally become extinct. But the life of the Ammonites now begins, and attains at once to a surprising development. In like manner, while some genera of terrestrial animals have passed away, others now, for the first time, "live, move, and have their being." The huge Chelonians now surge through the seas, and bask in the sunshine on the borders of the great lakes. The saurian reptiles assume colossal proportions, preparing the way for those yet more gigantic Saurians which belong to the following period, and whose enormous skeletons and laidly aspect excite the awe and astonishment of all who gaze upon their marvellous remains.

Few animal relics, however, are found in the Bunter sandstone, although it bears numerous traces of the Labyrinthodon.

The Muschelkalk is so named from the multitude of shells which it embodies, and of which, in truth, it consists; including vast numbers of Molluscs, twelve different genera of saurian reptiles, some Cheloniæ, or turtles, and six new genera of cuirassed or armour-plated fishes.

Let us pause, for a moment, to gain some conception of the molluscous varieties.

The *Brachiopods* are still represented by *Terebratula*, *Lingula*, *Spirifer;*

The *Conchifera*, by *Trigonia*, *Mya*, *Plagiostoma*, *Ostrea*, *Avicula;*

The *Gasteropods*, by *Turbo*, *Turritella*, *Buccinum*, *Natica*, *Rostellaria;*

The *Cephalopods*, by *Ceratites*, *Nautilus*, *Belemnite*, *Rhyncholite*, *Orthoceras*.

The *Mytilus*, or Mussel, which properly belongs to this sub-period, is the acephalous (or headless) Mollusc, with elongated triangular shell, of which many species inhabit our existing seas. Other acephalous Molluscs of the same time were the *Lima*, *Myophonia*, *Posidonia*, and *Avicula*.

Among the Cephalopods we select the *Belemnites* as worthy of more particular notice. They differ from other fossil chambered shells in having their chambers inclosed within a cone-shaped fibrous sheath, resembling in form the point of an arrow, whence they derive their name.

A *Belemnite* may be described as a compound internal shell, consisting of three essential parts:—

First, a fibro-calcareous cone-shaped shell, terminating at its larger end in a hollow cone.

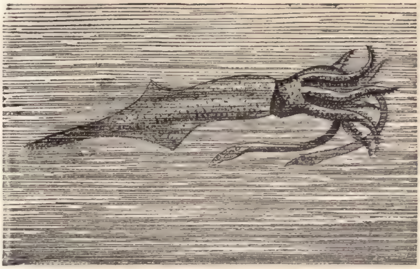
Second, a conical thin horny sheath, or cup, commencing from the base of the hollow cone of the fibro-calcareous sheath, and rapidly enlarging as it extends outwards to a considerable distance. This cup-like sheath formed the anterior chamber of the *Belemnite*, and contained the *ink bag* and some other viscera.

Third, a thin conical internal chambered shell, called the *alveolus*, placed within the hollow calcareous cone already described.

This portion of the shell is closely allied in form and construction to the *Nautilus* and *Orthoceratite*. Thin transverse plates divide it into a series of narrow air-chambers, or areola, resembling a pile of watch-glasses, gradually diminishing towards the apex. Outwardly these plates are concave, inwardly convex; and a continuous siphuncle, or locomotor tube, runs through all of them.

Every animal was provided, like the modern *Sepia*,* with an ink-bag nearly a foot in length. Hence we may conclude that they had an internal shell; the ink-bag being a defensive provision entirely confined to naked Cephalopods.

From the weight of their internal shell we may suppose that they usually maintained a vertical position; and as their chambered portion was supplied with a locomotor tube, or siphuncle, like the *Nautilus*, they probably rose and sunk in the water with the utmost facility.



Belemnite restored.

These fossils are popularly known as Arrow-heads, Thunderstones, and Fingerstones. The species are nearly 100 in number. The reader should remember that they are not the animals themselves, but the internal organisms of those animals; naked cephalopods, which protected themselves by clouding the water with discharges of inky fluid, just as Homer's gods and goddesses, when threatened by any danger, surrounded themselves with an impenetrable cloud or mist.

The numerous family of the *Ammonites* now demands our notice. Their essential parts, it will be seen, were so similar in principle to those of the *Nautili* shells, that we cannot doubt they answered a like purpose in the economy of the extinct species of cephalopodous molluscs from which these *Ammonites* have been derived.

They received their name from the resemblance of their beautiful shell to the ram's-horn decorations which symbolically enriched the front of the Temple of Jupiter Ammon, and the bas-reliefs and statues of the Pagan deity. Shells are all that remain of them. The living organism has long since disappeared.

Like the *Belemnite*, and like the *Nautilus*, the *Ammonite* consisted of three essential parts—

First, an external shell, usually of a flat, disc-like form, having its surface strengthened and ornamented with ribs.

Second, a series of internal air-chambers formed by transverse plates intersecting the inner portion of the shell.

Third, a siphuncle, siphon, or locomotor tube, which began at the bottom of the outer chamber, and perforated the entire series of air-chambers to the innermost extremity of the shell.

The uses of the shell of the *Ammonites*—an external, not internal shell, let it be remembered—have been frequently discussed. They have been demonstrated by Dr. Buckland with a truth and clearness unsurpassed by any later writer, and our description will closely follow his very graphic and interesting account.

Ammonites rostratus.

As the shell served the twofold office of affording protection to the internal organism, and enabling it to float, it was necessary that it should be thin, or its weight would prevent it from rising to the surface. But it was not less necessary that it should be strong enough to resist the pressure of the mass of waters at the bottom, or in the mid-depths of the sea. Accordingly, we find that its Creator has admirably adapted it for its double function by so disposing its materials as to combine strength and firmness with lightness and buoyancy.

Let it be noticed, in the first place, that the entire shell is one continued arch—and no form, as any architect will tell you, is better fitted to resist superincumbent pressure—is one continued arch, we say, coiled spirally around itself in such a manner, that the base of the *outer* whorls rests upon the corner of the *inner* whorls, and the keel or back is thus calculated to resist weight, on the same principle that the shell of a common hen's egg will endure considerable force, if that force be applied in the direction of its longitudinal diameter.

Let it be noticed, secondly, that, in addition to this general arch-like form, the shell is further strengthened by the insertion of *ribs*, or transverse arches, which give to many of the species their characteristic feature, and in all produce that peculiar beauty which, for every artist's eye, invariably distinguishes the symmetrical repetition of a series of spiral curves.

From the disposition of these ribs over the surface of the external shell, mechanical advantages are obtained for increasing its strength, founded on a principle that we see everywhere practically applied in works of human art and science—the principle, namely, by which the strength and rigidity of a thin plate of metal are considerably enhanced by corrugating, or fluting, the surface.

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* Professor Owen has demonstrated that the animal of which the *Belemnites* was the internal bone, was, in reality, a dibranchiate eight-armed cuttle-fish, like the modern genus *Onychoteuthis*.

A common pencil-case, if made of corrugated or fluted metal, is stronger than if the same quantity of metal were disposed in a simple tube.

Similarly, culinary moulds of tin or copper are strengthened by arranging folds, or flutings, around their margin, or upon their convex surfaces.

The application, now so general, of thin plates of corrugated iron or zinc to the purpose of building self-supporting roofs, in which the corrugations answer the purpose and supply the place of beams or rafters, is actually founded on the very same principle that strengthens the vaulted shells of the *Ammonites*.

For in all these cases the ribs, or elevated portions, bestow upon the layers of shell or plates of metal all the extra strength which results from the convex form of an arch, without materially increasing the burthen; while the intermediate depressed parts between these arches are at once suspended and supported by the tenacity and substantialness of the material.

The general principle of dividing and subdividing the ribs, in order to multiply supports as the vault enlarges, is conducted nearly upon the same plan, and for the same purpose, as the divisions or subdivisions of the ribs beneath the *groin work*, in the flat vaulted roofs of the later Gothic architecture.

But many species of *Ammonites* are further strengthened by the elevation of parts of the ribs into little dome-shaped *tubercles*, or *bosses*, thus superadding the strength of a dome to that of the simple arch, at each point where these bosses are inserted. This contrivance has also been imitated by the Gothic architects, who have applied the bosses to the intersections of the ribs in their highly ornamented roofs.

Bearing in mind, then, all these extraordinary instances of a surpassing skill and foresight, may we not say, with Dr. Buckland, that we reverently recognize the exercise of discretion and economy in the midst of abundance; distributing internal supports but sparingly to parts which, from their external form, were already strong, and dispensing them abundantly beneath those parts only which without them would have been weak.

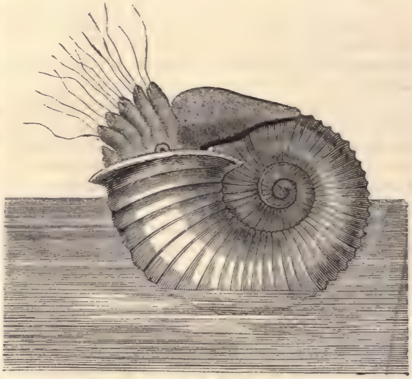
"We find," says the eminent geologist we have referred to, "an infinity of variations in the form and sculpture of the external shell, and a not less beautiful variety in the methods of internal fortification, all adapted, with architectural advantage, to produce a combination of ornament and utility. The ribs also are variously multiplied, as the increasing space demands increased support; and are variously adorned and armed with domes and bosses, wherever there is need of more than ordinary strength."

The utility of the transverse plates and air-chambers of the Ammonites will be readily comprehended. The former are intended to increase the strength of the external shell by multiplying the subjacent points of resistance to outward pressure. At no great depth the weight of the sea will force a cork into a bottle filled with air, or crush a hollow cylinder or sphere of thin copper. As the air-chambers of the Ammonites were subject to a similar burthen when at the bottom of the sea, they could only be preserved from destruction by some peculiar provision.

The reader will now inquire, how or in what manner the little ocean-roamer ascended or descended in the deeps at will?

This valuable power was obtained by the agency of the siphuncle, or, as we would call it, locomotor tube, which, as in the case of the *Nautilus*, was virtually a pipe, ejecting or admitting the sea-water according as the animal wished to rise or sink. When it desired to retire to the depths it took on board, so to speak, the necessary quantity of sea-water; of which it duly relieved itself when it wished to ascend.

The manner in which the shell of the Ammonite was adapted to the twofold purpose of acting as a float, and protecting the body of its inhabitant, displays the wisdom and power of the Creator no less signally than the structure of the elephant's trunk. As the animal increased in size, and advanced along the outer chamber of its shell, the spaces which it left behind were successively converted into air-chambers, thus increasing simultaneously the potency and efficiency of the float. This float, regulated by the siphuncle, and penetrating the entire series of the chambers, formed an hydraulic instrument of extraordinary delicacy.



Ammonite restored.

To sum up:—

To creatures that occasionally floated, a thick heavy shell would have been wholly inapplicable. On the other hand, a thin shell, inclosing air, would have been subject to a pressure that must have proved fatal to it. A series of provisions, therefore, was designed by the Creator to secure the necessary strength while preserving the necessary lightness.

First, the shell was made up of a tube coiled round itself and externally convex.

Secondly, it was fortified by a series of ribs and vaultings disposed in the form of arches and domes on the convex surface of this tube, and still further augmenting its strength.

And, thirdly, the transverse partitions which formed the air-chambers provided also a continuous succession of supports, extending their ramifications, with many mechanical advantages, beneath the weakest portions of the shell.

The *Ceratites*, which were very abundant in the Triassic ocean, formed a genus closely allied to the *Ammonites*.

In the Muschelkalk, the formation we are now considering, are found the teeth and skull of the *Placodus gigas*, a saurian reptile of peculiar character.

Another reptile of great dimensions, which may be regarded as a kind of fore-shadowing, or antetype, of the huge Saurians of the Jurassic period, was a marine crocodile, named the *Nothosaurus*.

To this period also belonged the *Telerpeton*, so called by Dr. Mantell, but referred by Professor Owen to a genus which he denominates *Leptopleuron*. Its characteristic is the slenderness of its ribs, of which there are four and twenty pairs, and which seem to have been attached by a simple head, as in the lizards. It was probably amphibious in its habits, though exhibiting its affinity to our existing land-lizards in the development of its limbs, the situation of its pelvis, and other general features.

Among Triassic reptiles of a sauroid character we may also name the *Phytosaurus*, the *Thecodontosaurus*, the *Hyperodapedon*, and the crocodile-like *Staganolepis*.

Among the Triassic Echinoderms may be mentioned the *Encrinus moniliformis* and *Encrinus liliformis*, the latter a wonderfully beautiful imitation of the lily, whose remains in some districts compose whole masses of rock, and illustrate the slow progress with which this zoophyte developed the limestone beds in the bright transparent Triassic seas.

In the keuper formation of the Triassic there do not occur any new forms of organic life. Cephalopods, Ceratites and Ammonites, Gasteropods, Lamellibranchs, Echinoderms, were singularly abundant; the Labyrinthodonts crawled on the sandy shore; and the great Saurians wallowed among the slime and sedge.

The accompanying engraving (Plate 2) is an attempt to reproduce the characteristic scenery of the Muschelkalk sub-period. This belongs to the Triassic, or New Red Sandstone period, but is a group of strata wholly wanting in England. German writers divide the Triassic (trias, or triple) into three groups, as follows, in descending order:—Keuper, answering to the French *Marne irisée*, and our English "gypseous shales and sandstone;" Muschelkalk, answering to the French *Calcaire coquilier;* and Bunter sandstone, answering to the French *Gres bigarré*, and our English "sandstone and quartzose conglomerate."

The Muschelkalk, it is necessary to explain, consists of beds of compact limestone, often greyish, sometimes black, alternating with marl and clay, and generally containing such numbers of shells that it has received from the Germans the name of *shelly limestone* (Muschelkalk).

The seas of this sub-period included, not only hosts of molluscs, but twelve different genera of saurian reptiles, some turtles, and six new genera of cuirassed or armour-clad fishes. We have already indicated some of the more remarkable species—the *Ceratites*, the *Mytilus* or mussel, the *Lima lineata*, the *Sphærodus*, and the *Pycnodus*. The vegetation had also its distinctive characters: large-leaved *Haidingeras*, not unlike our New Zealand araucarias, but more closely resembling the damara; cone-pointed *Voltzias*, a genus of Cupressinaceæ, now extinct. In his "Botanic Geography" M. Lecoq observes:—

"While the variegated sandstones and mottled clays were being slowly deposited in regular beds by the waters, magnificent ferns still exhibited their light and elegantly-carved leaves. Divers *Protopteris* and majestic *Neuropteris* mingled in vast forest-like masses, where also flourished the *Crematopteris typica* of Schimper, the *Anomopteris Mougeotii* of Brongniart, and the pretty *Trichomanites nigrophyllum*. The conifers of this epoch attain a very considerable development, and would form graceful forests of verdurous trees. Elegant monocotyledons, representing the forms now prevalent in tropical climes, seem to appear for the first time. The *Yuccites Vogesiacus* of Schimper constituted groups at once very extensive, and ranged in densest order.

"A family, hitherto doubtful, shows itself under the elegant form of *Nilssonia Hogardi*. It is still recognizable in the *Zamites Vogesiacus*; and the varied groups of the cycads, organized like conifers and beautiful as palms, now decorate the earth, which in these new types manifests its inexhaustible fecundity.

"The most remarkable of the herbaceous plants which then composed the forest undergrowth, or luxuriantly overspread its tepid marshes, is the *Æthophyllum speciosum*. In organization it approximates to the lycopods and Thyphaceæ, the *Æthophyllum stipulare*, and the curious *Schizoneura paradoxa*. Thus we can trace the commencement of the reign of the dicotyledonous plants, with naked seeds, which afterwards became so widely distributed. A few angiosperms, belonging principally to the families of the conifers and Cycadeaceæ, were still represented in the vegetation of this sub-period. The first, very abundant at the outset, associated themselves with the cellular cryptogams, which, though decreasing, were still numerous; and, at a later date, with the Cycadeaceæ, which present themselves but slowly, though in due time taking no unimportant share in the great work of harmonizing the vegetable kingdom."

These details will enable the reader more easily to understand our ideal landscape.

A violent but transient storm has convulsed the sea of the Muschelkalk, and its waters break on the shore in clouds of foam and spray. As they recede into the depths, we catch sight of numerous aquatic animals. These are the Encrinites, with their long flexible stems, like coils of rope; some few Mytili and Terebratulæ. In search of prey the Nothosaurus has dragged his huge bulk to the beach, and on the same surf-beaten rock crawl several of his congeners, but of a smaller species. The sandy dome is crowned with a vigorous group of Haidingeras, whose large trunks, drooping branches, and inclined foliage remind us of our modern cedars. The elegant Voltzias enhance with their beauty the charms of this striking vegetation. The reptiles which haunted the shadows of these primeval forests are represented by the *Labyrinthodon*, which descends towards the sea on the right, and whose curious footprints have been preserved, imprinted in the indurated sand, down to our own days, as if designed to answer the interrogations of science by their strange memorials of a long-vanished age.

THE JURASSIC PERIOD.

We now come, in our survey of the animal life of the primeval world, to the Jurassic period, so named from the Jura mountains in France, which consist of the rocks deposited by the seas of this era.

It is subdivided into two sub-periods: the *Lias* and the *Oolite*.

Both in its fauna and its flora it displays "a very striking assemblage of characteristics:" many genera of animals belonging to the preceding formations have disappeared, and their places been filled up by new genera, comprising a very peculiarly organized group, which included not less than four thousand species.

The Lias.—This is the name given by English geologists to an argillaceous limestone, mixed with marl and clay, which forms the base or lower stratum of the Jurassic formation, and have a mean thickness of about three hundred feet.

Herein the naturalist meets with zoophytes, molluscs, and fishes of a singular organization; but, above all, with reptiles of a size so extraordinary and a structure so marvellous, as to give the Liassic seas an interest and a character of their own.

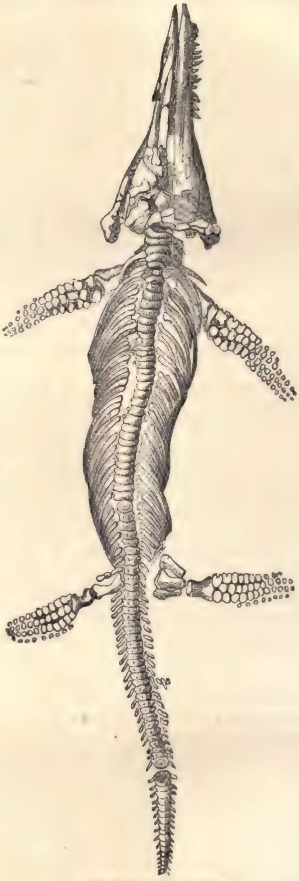
First let us examine the *Plesiosaurus*, which Cuvier pronounced the most monstrous animal that has yet been dug out of the ruins of a former world.

We gather from its name—*πλησίος*, "near," and *σαῦρος*, "lizard"—that it was nearly allied by its organization to the Saurians. But in appearance it seemed a compound of many animals; it had a lizard's head, a crocodile's teeth, a neck of excessive length resembling a swan's, the ribs of a chameleon, a body and tail whose proportions were those of an ordinary quadruped, and, finally, the paddles of a whale. Such was the apparently grotesque and fantastic monster which roamed through the Liassic ocean, seeking what it might devour.

The head of the *Plesiosaurus*, says Figuier, in his popular history of "The World before the Deluge," presented a combination of the characters belonging to the ichthyosaurus, the crocodile, and the lizard. Its long neck consisted of a greater number of vertebræ than the neck of either the camel, the giraffe, or even the swan, which of all the feathered race has the longest neck in proportion to the bulk of its body. And in birds it is to be noted, that contrary to the structure of the Mammalia, where the vertebræ of the neck are never more or less than seven, their vertebræ increase in number as the neck increases in length.

The body of the *Plesiosaurus* was rounded and cylindrical, like that of the *Cheloniæ*, or great marine turtles. Some authors suppose it to have been invested in a carapace or scaly armour; but of this there is no proof, and no traces of any such covering have been recognized with the fossil remains hitherto examined.

In its breast, pelvis, and the bones of its anterior and posterior extremities, the *Plesiosaurus* possessed an apparatus which permitted it, like the Cetacea of our present seas, to sink in the water or ascend to the surface at pleasure. That they were air-breathing and cold-blooded animals is proved, as Professor Owen shows, by the position and conformation of the nasal passages, as well as by the bony mechanism of the thoracic duct and abdominal cavity.



Ichthyosaurus platydon.

Many points in the anatomical structure of this huge animal are particularly worthy of the naturalist's attention. The vertebræ of its back were not arranged, as is the case with fishes, in hollow cones, but their surfaces were nearly flat, and thus the column had a firmness and solidity like that which exists in the back of terrestrial creatures. Such a contrivance was rendered necessary by its immense length and bulk. For the same purpose the articulating processes were locked into one another, just as the architect, in erecting a column, clamps together the massive stones as he rises stage by stage. Rapidity of motion was not essential for the *Plesiosaurus*, whose colossal proportions rendered it formidable to nearly all then existing animals, and which, for offensive and defensive purposes, could trust to its size and strength. Its tail, therefore, was comparatively short, and not used, like the tail of a fish, as an instrument of swift impulsion; but rather as a steering apparatus, by which it directed its course along the water, and its movements of ascent and descent.

Rapidity of motion was, in truth, impossible for an animal with so elongated a neck, situated at such a distance in front of the anterior paddles.

The total number of vertebræ in the entire column was about ninety.

If we now turn to the structure of its ribs, we shall see that they were admirably adapted to give it the power of compressing air within its lungs, and consequently of remaining for a lengthened time at the bottom of the water.

They consisted of two parts, one vertebral and one ventral; the ventral portions of one side uniting with those on the opposite by an intermediate transverse bone, in such wise that each pair of ribs girdled the huge body with an unbroken belt, made up of five parts. A close similarity of structure may be observed, among existing animals, in the chameleon, and in two species of iguana, the *Lacerta marmorata*, and *Lacerta anubis*.

It has been conjectured, from the great size of the lungs of the *Plesiosaurus*, as shown by this conformation of the ribs, and the varied intensity of its inspirations, that it possessed the power of changing at will the colour of its skin. We have no means of verifying this conjecture, but admit that such a provision would have been invaluable for an animal so heavy and unwieldy, which,

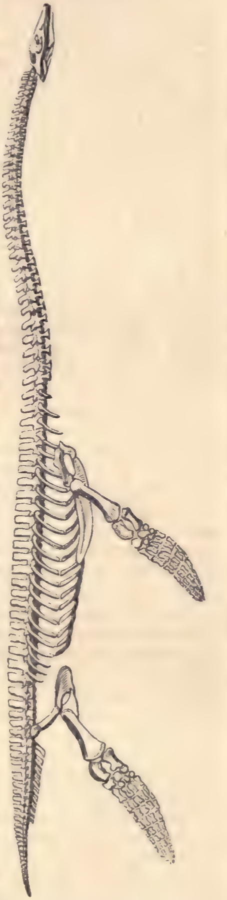
> "Like a wounded snake, drew its slow length along,"

as defending it by concealment from its most formidable antagonist, the *Ichthyosaurus*. In any contest with the latter, its chances otherwise must have been very few: it could not cope with it in assault, owing to its diminutive head and long slender neck; it could not escape from it by flight, owing to its limited powers of locomotion.

The *Plesiosaurus* being an air-breathing animal, would require to ascend to the surface frequently for respiring purposes. This was effected by the agency of an ingenious apparatus in the chest and pelvis, and in the bones of the arms and legs, which enabled it to ascend and descend in the "fluent tracts of ocean" like our modern Cetacea—its legs being converted into long and very powerful paddles.

If we compare these extremities with those of other vertebrated animals, we shall discern a perfectly regular series of "links and gradations," from the corresponding parts of the highest Mammals to their rudimentary forms in the fins of fishes.

The fore paddle of the *Plesiosaurus* presents us, typically, with all the essential parts of the fore-leg of a quadruped, even of a human arm. First, the scapula, or shoulder-bone; then the humerus, or arm-bone; next, the radius and the ulna, which are succeeded by the bones of the carpus and metacarpus; and these followed by five fingers, each composed of a continuous series of phalanges, or joints. Similar analogies to the leg and foot of the Mammalia may be detected in the posterior paddle: the pelvis and femur, or thigh-bone, are succeeded by tibia and fibula, which duly articulate with the bones of the tarsus and metatarsus, followed by the numerous phalanges of five long toes.



Skeleton of Plesiosaurus dolichodeirus restored. (Conybeare principally.)

Founding his conclusions upon these interesting data, Professor Conybeare remarks:—That the *Plesiosaurus* was aquatic is evident from the form of its paddles; that it was marine, is almost equally clear from the remains with which it is universally associated; that it may have occasionally visited the shore, we infer from the resemblance of its extremities to those of the turtle. On land, however, its motion must have been singularly awkward; its long neck must have impeded its progress through the water; presenting a remarkable contrast to the organization which so admirably fitted the *Ichthyosaurus* for cleaving the waves.

May it not, therefore, be concluded—since, in addition to these circumstances, its respiration must have necessitated frequent supplies of fresh air—that it swam upon, or near, the surface; arching back its long neck like the swan, and occasionally darting it down at the fish which came within its reach?

At times, too, it may have lurked in the weedy shoals along the coast, where, buried among the rank luxuriance of the aquatic plants, and raising its nostrils to a level with the surface from a considerable depth, it may have found a secure asylum from the attacks of its formidable enemies. The length and flexibility of its neck must to a great extent have counterbalanced the deficient strength of its jaws, and its incapacity for rapid motion on land or water, by the suddenness and directness of the assault they enabled it to deliver against every animal fitted for its prey which was swept within the range of the destroyer.

Thus, then, though Cuvier might characterize it as one of the most anomalous and monstrous productions of the ancient systems of creation, a close investigation reveals the fact that these apparent anomalies consist only in the diversified arrangement and varied proportion of parts, which, fundamentally, are the same as those occurring in the most harmoniously-formed creatures of the present world. There are no anomalies in the economy of Nature. The bee is not more ingeniously fitted for its peculiar functions in sipping the honied sweets of nectared flowers, and storing them up in its beautifully devised cells, than was the mighty *Plesiosaurus*, with its lizard's head, its serpentine neck, its chameleon ribs, and cetacean paddles, for the part it played in the shallow waters of the Liassic seas.

Pursuing the analogies of construction, says Dr. Buckland,* that connect the existing inhabitants of the earth with those extinct genera and species which preceded the creation of our race, we find an unbroken chain of affinities pervading the entire series of organized beings, and connecting all past and present forms of animal existence by close and harmonious ties. Even our own bodies, and some of their most important organs, are brought into close and direct comparison with those of reptiles, which, at first sight, appear the most terrific birth of primeval creation; and in the very hand and fingers with which the palæontologist records their history, we recognize the type of the paddles of the *Ichthyosaurus* and *Plesiosaurus*.

If we extend a similar comparison through the four great classes of vertebrated animals, we discover in each species a marvellously varied adaptation of analogous parts to the different circumstances and conditions under which it was destined to live, move, and have its being.

Ascending from the lower orders, we trace a gradual advancement in structure and office, until we arrive at those whose functions are the loftiest and most comprehensive. Thus, the fin of the fish developes into the paddle of the reptiles *Plesiosaurus* and *Ichthyosaurus*. The same organ is converted into the wing of the Pterodactyle, the bird, and the bat. It becomes the fore foot, or paw, of terrestrial quadrupeds, and attains its highest consummation in the arm and plastic hand of rational and inventive Man.

Another reptile of remarkable dimensions belonging to the Oolitic period was the *Ichthyosaurus*.† As in the modern *Cetacea*, its structure underwent such modifications as would adapt it for an aquatic life. If it possessed a lizard-like tail, it possessed also the body of a fish, and limbs developed into paddles. If its snout resembled that of a porpoise, its teeth were those of a crocodile; and while it had the vertebræ of a fish, it had the head of a lizard and the sternum of an ornithorhynchus. At first sight such a combination seems deserving of the appellation "monstrous;" but our previous studies have prepared us to recognize that this combination was admirably designed for certain peculiar conditions.

In its general outline the *Ichthyosaurus* must have borne a rough resemblance to the modern porpoise and grampus. It had four broad feet, or paddles, and terminated behind in a long powerful tail, which Professor Owen believes was placed vertically, because the vertebræ are compressed vertically, and also because it is frequently found disarticulated a short distance from its extremity, as if the weight of the upright tail had induced its fall on the commencement of the animal's decomposition. More than thirty species have been discovered, some of which must have exceeded thirty feet in length. Their principal points of difference are in the form of the head; some possessing short broad skulls, like the common crocodile, others, a long slender snout, like the gavial of the Ganges.

In the head of the *Ichthyosaurus* the most remarkable feature was the eye, which in magnitude exceeded that of any living animal, and in some specimens has been found to measure fourteen inches in diameter. From the quantity of light admitted by this prodigious lens, the Ichthyosaurus must have been gifted with extraordinary powers of vision. It was equally well adapted for use in air or water, and for quickly changing the focal distance when in pursuit of prey. On the front of the orbital cavity in which it was placed, a circular series of thirteen or more petrified thin bony plates were disposed around a central aperture in which was lodged the pupil; the form and thickness of each plate closely resembling the scales of an artichoke. This circle had a telescopic effect, and enabled the *Ichthyosaurus* to discover its prey at great or little distances. It does not occur in fishes, but is found in many birds, and the bony sclerotic of the great fish-lizard very nearly approached in form the bony circle in the eye of the golden eagle.

The important advantage resulting from this curious optical apparatus was, that it strengthened the surface of the enormous eye-ball, so that it might resist the pressure of the deep water to which it must frequently have been exposed. Further, it protected the all-important organ from injury by the ocean waves; to which injury an eye, sometimes larger than a man's head, must often have been subject, when the nose was brought to the surface for the necessary purpose of respiring air. The position of the nostrils, close to the anterior angle of the eye, rendered it impossible for the *Ichthyosaurus* to breathe without raising its eye to the surface of the water.

Its jaws were composed of many thin plates, so disposed as to combine strength with lightness and elasticity, in a greater degree than would have been effected by single bones, like those in the jaws of a mammal. An under jaw so slender and so elongated as that of the *Ichthyosaurus*, employed in seizing and retaining the large and powerful animals which formed its prey, would have been comparatively weak, and liable to frequent mishaps, if composed of a single bone. Each side of the lower jaw, therefore, was made up of six separate pieces, in the same way that several thin pieces of steel are set together in the springs of carriages.

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* Notwithstanding the researches of modern geologists and palæontologists, Dr. Buckland's admirable work remains a standard authority, and should be perused by every student who would trace in the past history of creation the ever-recurring evidence of divine wisdom, power, and goodness.

† From *ιχθυς*, a fish, and *σαῦρος*, a lizard; *i.e.*, "fish-lizard," or "fish-reptile."

The reptile's short thick neck was continued backwards, from behind the eyes, in a vertebral column of more than one hundred vertebræ. As it was adapted, like the whale, for rapid motion through the sea, its vertebræ did not possess the invariable solidity of those of the crocodile, but rather the structure and lightness of those of fishes. The section of these vertebræ presents two hollow cones, connected with the centre of the vertebræ by their summits only, so as to permit the utmost flexibility of movement. "Between these hollow vertebræ a soft and flexible intervertebral substance, in the form of a double solid cone, is so placed that each hollow cone of bone plays on the cone of elastic substance contained within it, with a motion in every direction, thus forming a kind of universal joint, and giving to the entire column great strength and power of rapid flexion in the water. But as the inflections in the perpendicular direction are less necessary than in the lateral, they are limited by the overlapping, or contiguity of the spines. This mode of articulation gives mechanical advantage to animals like fishes, whose chief organ of progressive motion is the tail, and the weight of whose bodies, being always suspended in water, creates little or no pressure on the edges, by which alone the vertebræ touch each other."

The ribs were slender, most of them bifurcated at the top, and extended along the entire length of the vertebral column, from the head to the pelvis.

As the *Ichthyosaurus* was a massive animal, it required the means of facile descent and ascent in the water. This was provided by the construction of its anterior paddles, which were half as large again as the posterior, and by the no less extraordinary combination of bones that formed the sternal arch, or that part of the chest on which these paddles rested.

It has been remarked as a curious fact that this structure is found repeated in the ornithorhynchus of New Holland, an animal presenting the anomalous combination of a furred, duck-billed quadruped, with four webbed feet, suckling its young, and most probably ovoviviparous, which dives to the bottom in quest of food, and returns to the surface to breathe the air. In this living animal the Divine Maker appears to have repeated the organic contrivances which He had originally designed for the *Ichthyosaurus!*

To enable the animal to move in the water, both its anterior and posterior extremities were converted into fins and paddles, which must have much resembled externally the undivided paddle of a porpoise or whale. Internally the difference was considerable. The phalanges of the fingers were made up of ninety to one hundred polygonal bones. A specimen of the posterior fin of the *Ichthyosaurus communis*, discovered at Barrow-on-Soar, in Leicestershire, in 1840, exhibited on its posterior margin the remains of cartilaginous rays, which bifurcated towards the edge, like those in the fins of a fish. It had previously been supposed, remarks Professor Owen, that the locomotive organs were enveloped, while living, in a smooth integument, like that of the turtle and porpoise, which has no other support than is afforded by the bones and ligaments within; but it now appears that the fin was much larger, expanding far beyond the osseous framework, and deviating widely in its fish-like rays from the ordinary reptilian type. It is the opinion of our great comparative anatomist that these stiff-necked Saurians were furnished, in addition to the anterior paddles, with a tail-fin, possessing no radiating bones, and purely tegumentary, which expanded vertically to assist them in turning, and not horizontally, as in the whale.

The teeth of the *Ichthyosaurus* are conical, and resemble those of the crocodile, but are considerably more numerous, amounting in some individuals to a hundred and eighty. They vary in each species. Not inclosed in deep and separate sockets, like those of the crocodile, they bristle along one continuous furrow of the maxillary bone, where the rudiments of a separation into distinct alveoli (or cavities) may be detected in slight ridges extending between the teeth, on the sides and bottom of the furrows. The contrivance by which the old teeth give place to new is analogous in the *Ichthyosauri* to that existing in the crocodiles. In both the young tooth begins its growth at the base of the old one, where, by pressure on the side, it causes first a partial absorption of the base, and, finally, a total removal of the body of the older tooth which it is intended to replace.

From their predatory habits these huge reptiles of the secondary epoch were exposed to frequent loss of teeth; but as we have seen, an abundant provision was made for their renewal.

These details will suffice to convince our readers that they were animals potently armed either for attack or defence. Whether their skin was smooth like that of the whale, or covered with scales like that of the crocodile, we cannot absolutely determine; but it is probable that the former condition existed.

Popularly speaking, we may say, with Bayle, that the *Ichthyosaurus* was the whale of the Saurians, the Cetacean of the primeval seas. "It was, in fact, an animal exclusively marine, which on shore would rest motionless, like an inert mass: its whale-like paddles and fish-like vertebræ, the length of the tail, and other parts of the structure, prove that its habits were aquatic, while the remains of fishes and reptiles (discovered in its intestines), and the form of its teeth, show that it was carnivorous. Like the whale, also, the *Ichthyosaurus* breathed atmospheric air; so that it was under the necessity of coming frequently to the surface of the water, like that inhabitant of the deep." We can even believe, with Bayle, that it was provided, like the whale, with vents, or blowers, through which it ejected, in columns into the air, the water it had swallowed.

The Liassic formations which occur in Dorsetshire, in the vicinity of Lyme Regis, have long been famous among geologists for the fossil treasures which they have yielded to the persevering inquirer. Their quarries form the cemetery of the *Ichthyosauri*, the sepulchre which has long entombed those strange creations of the ancient seas. It was in 1811 that Mary Anning, a young peasant woman who gained a precarious livelihood by collecting fossils, first discovered the Ichthyosaurian skeleton. She hired workmen to excavate the immense block of Lias wherein it lay embedded, having endured the changes of unnumbered years, and slept the stony sleep of ages. Thus was the first of these colossal reptiles exposed to the wondering gaze of science; a reptile some thirty feet long, with jaws nearly two yards in length, and huge saucer-like eyes; eyes which have since been found so perfect, that the petrified lenses have been disengaged, and employed as magnifiers.

In the same strata have been found the half-digested remains of the prey of these voracious creatures, and more, their fæcal debris, or to use the scientific term, their *Coprolites*, or petrified fæca, from which we are able to determine their intestinal conformation, and the character of their usual food.

On the shore at Lyme Regis these coprolites are so abundant that they lie in some parts of the Lias scattered over the ground like potatoes. In the Lias of the Severn estuary they are yet more abundant, being disposed in strata of many miles in extent, and mixed so plentifully with teeth and rolled fragments of the bones of reptiles and fishes, as to prove beyond question that this region, having been the bottom of an ancient sea, was for a long period the *cloaca maxima*—the grand receptacle of the bones and fæcal remains—of its inhabitants.

In variety of size, and in external form, the coprolites resemble oblong pebbles or kidney potatoes. For the most part they vary from two to four inches in length, and from one to two inches in diameter. Some few are of much larger dimensions, and bear a due proportion to the gigantic calibre of the largest Ichthyosaurians; others are small, and bear a similar ratio to the more infantine members of the same species, and to the smaller fishes. Some are flat and amorphous, as if the substance had been ejected in a semi-fluid condition; not a few have been flattened by the pressure of the superjacent slate. Their usual colour is an ashen grey, but sometimes they are grey and black, and sometimes wholly black. Their material, so to speak, is of a compact earthy texture, resembling indurated clay, and marked by a conchoidal and glossy fracture.

Of the coprolites at Lyme Regis the structure is usually tortuous, but the number of coils is very irregular. In most cases there are three coils, in no instance do they exceed six; the variations probably depending on the various species of animals from which they are derived.

The section of one of these fæcal balls exhibits the interior arranged in a folded plate, wrapped spirally round from the centre outwards, like the whorls of a turbinated shell. Their exterior also retains the corrugations and minute impressions which, in a plastic condition, they received from the intestines of the living animals.

Irregularly but abundantly scattered throughout these fossilized fæces are the scales, and occasionally the teeth and bones, of fishes, which seem to have passed undigested through the bodies of the Saurians; just as the enamel of teeth, and sometimes fragments of bones, are found undigested both in the recent and fossil *album græcum* of hyænas. The bones are chiefly vertebræ of fishes and of small Ichthyosauri. Hence we must conclude that these monsters of the ancient deep, like many of their successors in our present seas, habitually devoured the smaller and weaker individuals of their own race. Probably they swallowed their victims whole, without dividing them; in which case the stomach and intestines must have formed a kind of voluminous pouch, filling entirely the abdominal cavity, and corresponding in size to the immense development of the teeth and jaws.

From the contents of the coprolites we may indirectly infer that in the conformation of their intestinal canal the Ichthyosauri resembled the voracious shark and dog-fish, which they also resembled in their destructive propensities and powers. In the intestines of these fishes we find existing an arrangement not unlike that of the interior of an Archimedean screw; an arrangement most ingeniously adapted to *increase the extent of internal surface* for the absorption of nutriment from the food, during its passage through a coiled and continuous spiral tube.

There is also abundant evidence to show the very form of the minute vessels and folds of the mucous membrane which lined the intestine—this evidence consisting of a series of vascular impressions and corrugations on the surface of the coprolite, that could only have been communicated during its passage through the convolutions of the intestinal tube.

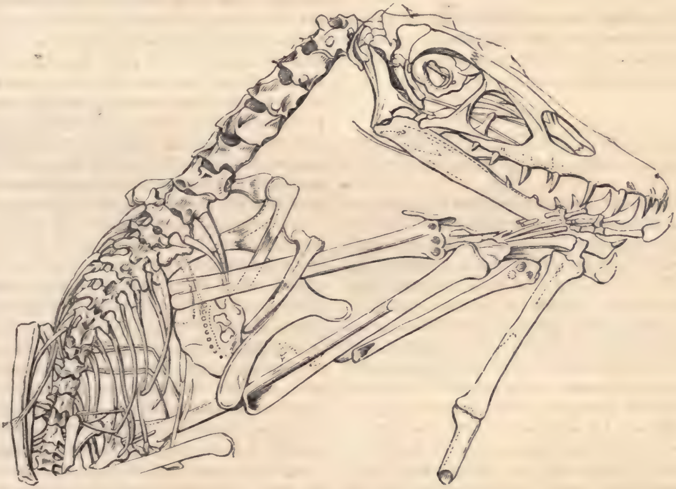
Do we ask what was the utility of these curious provisions in the bowels of the extinct monsters of the ancient seas? A satisfactory reply is easily given. Owing to their insatiable voracity, it was needful the stomach should be both large and long, leaving but little space for the smaller viscera. These, therefore, were reduced, as we have seen, nearly to the state of a flattened tube, coiled like a corkscrew around itself. While their bulk was thus materially diminished, the amount of absorbent surface remained almost the same as if they had been circularly disposed.

Had a considerable expansion of intestines been superadded to the enormous stomach and lungs of the *Ichthyosaurus*, the consequent enlargement of the body would have diminished the power of progressive motion, to the serious detriment of an animal which depended on its swiftness for the capture of its prey.

These considerations will teach us that even small and apparently mean and insignificant objects are frequently well deserving the minute attention of science. In the intestinal structure of the Ichthyosaurians we find an analogous system of organs to that which obtains in living animals, and are thus enabled to establish the continuity of the divine work, to trace the links of an unbroken chain from the earliest ages of creation down to the present time. The mind is carried back over the waste of years to the dawn of time, to the gradual formation of our planet, and its slow adaptation to the wants and necessities of man, its last and greatest inhabitant. "When we discover," says an illustrious geologist, "in the body of an *Ichthyosaurus* the food which it has engulphed an instant before its death, when the intervals between its sides present themselves still filled with the remains of fishes which it had swallowed some ten thousand years ago, or a time even twice as great, all these immense spaces vanish, time disappears, and we find ourselves, so to speak, thrown into immediate contact with events which took place in epochs immeasurably distant, as if we occupied ourselves with the affairs of the previous day."

It has been justly said, by a recent writer, that there are no monsters in nature; that in no animal organism, past or present, have the laws of being ever been positively infringed; that the antediluvian animals were neither the mistakes nor the freaks of Providence; but that in all the proofs of divine intention are indisputably evident. To this conclusion the reader will have been led by our previous investigations. Yet he might almost be forgiven if, at his first sight of a *Pterodactyle*, either in a woodcut, or in one of Mr. Waterhouse Hawkins' ingenious reproductions, he pronounced it a monstrous birth of creation, the realization of some wild and weird dream, a frightful and a perplexing anomaly! In strangeness of construction, and hideous impressiveness of aspect, it assuredly surpasses all its Liassic contemporaries. Even the *Megalichthys* and the *Plesiosaurus* cannot compare with it in these respects.

The Pterodactyle.[*]—Its fossil remains were first discovered in 1828, and the discovery induced Cuvier to withdraw the sentence he had pronounced upon the *Ichthyosaurus*, and award to the new-found "the palm of monstrosity."



Pterodactylus crassirostris.

Naturalists at the outset were greatly perplexed in deciding to what natural order it belonged. Some looked upon it as a bird, others as a species of bat, and others, more accurately, as a flying reptile.

This discordance of opinion respecting a creature whose skeleton was found almost entire originated in the presence of characteristics apparently belonging to each of the three classes to which it was referred. Thus, in the form of its head and the length of its neck it resembled a bird; in the shape and proportion of its wings it might fairly be likened to a bat; while, again, its tail and body approximated to those of ordinary Mammalia. Add to these strangely diverse features a small skull, like a reptile's, and a beak armed with not less than sixty pointed teeth, and a combination of apparent anomalies is attained which only the genius of a Cuvier could reconcile. In the hands of the great French naturalist every obscurity was swept away; every discord reduced to harmony; and the seeming monster of the ancient world converted into one of the most striking examples yet afforded by comparative anatomy of the exquisite oneness that inspires and informs all nature, in its adaptation of the same parts of the animal frame to infinitely varied conditions of existence.

The *Pterodactyle*, then, belongs to an extinct genus of the order *Saurians*, in the class *Reptiles*; a genus adapted by certain peculiarities of structure for motion in the air. That anterior extremity which, in the foreleg of existing lizards and crocodiles, forms a terrestrial locomotive organ, was, in the Pterodactyle, converted into a membraniferous wing; while other parts of the body underwent such modifications as adapted the entire animal machine for the functions of flight.

Of all the creatures whose existence Geology has revealed to us, says Cuvier,[*] the Pterodactyle is incontestably the most extraordinary, and that which, if we saw it alive, would appear to us the most opposed to the present animal creation.

[*] From πτερόν, a wing, and δάκτυλος, a finger.

[*] "Ce sont incontestablement de tous les êtres dont ce livre nous révele l'ancienne existence, les plus extraordinaires, et ceux qui, si on les voyait vivans, paroîtroient les plus étrangers à toute la nature actuelle."—Cuvier, *Ossemens Fossiles*, vol. ii. 379.

In external form it might generally be compared to our modern bats and vampires. But most species had the nose elongated like the snout of a crocodile, and armed with conical teeth. Their eyes were of enormous size, apparently to provide for their nocturnal wanderings. From their wings projected fingers, terminated by long hooks, like the curved claw on the thumb of the bat; the whole enabling them to creep, or climb, or suspend themselves from the boughs of trees, with admirable facility.

It is probable also that these strange "anomalies" possessed the power of swimming, with which so many reptiles are endowed, and which is now an attribute of the Vampire Bat (*Pteropus pselaphon*) of the Island of Bonin.

"Thus, like Milton's fiend, qualified for all services and all elements, the creature was a fit companion for the kindred reptiles that swarmed in the seas, or crawled on the shores of a turbulent planet:—

> 'The Fiend,
> O'er bog, or steep, through strait, rough, dense, or rare,
> With head, hands, wings, or feet, pursues his way,
> And swims, or sinks, or wades, or creeps, or flies.'*

With flocks of such-like creatures flying in the air, and shoals of no less monstrous Ichthyosauri and Plesiosauri swarming in the ocean, and gigantic crocodiles and tortoises crawling on the shores of the primeval lakes and rivers, air, sea, and land must have been strangely tenanted in these early periods of our infant world."

From its teeth to the end of its claws, however, in all its osteology, the creature, as Cuvier pointed out, presents the features of the Saurians; nor may it be doubted that their characteristics existed in its integuments and softer parts, in its scales, its circulation, its generative organs. It was provided with the means of flight, it is true, but when stationary could have made but little use of its anterior extremities, even if it did not keep them always folded as birds fold their wings. It employed its small anterior fingers, as we have already hinted, in suspending itself from the branches of trees, but when at rest must generally have placed itself on its hind feet, like the birds again; and like them it must have carried its neck half-erect and curved backwards, so that its enormous head should not disturb its equilibrium.

From the birds the Pterodactyle was separated by the form of its pelvis, the narrowness of its sides, the small number of its cervical vertebræ, and the long rows of teeth which armed its jaw. From the bats it was distinguished by the peculiar shape of its head and teeth.

It was, then, a lizard-like reptile, provided with bat-like wings; the largest species not exceeding ten or twelve inches in length, while the smaller were about the size of the snipe. Its head was out of all proportion to the rest of the body. The vertebræ of the neck were six or seven in number. The ribs were thin and thread-shaped, like those of lizards. Its extremities terminated in five fingers, the joints of the fifth being lengthened so as to become expansions of the membranous wing.

If we compare the foot of the Pterodactyle with that of the bat, we perceive that the latter, like most other mammals, has three joints in every toe, excepting the first, which has only two. These two, however, in the bat, are *equal in length* to the three bones of the other toes, so that the five claws of its foot range in one straight line, forming altogether the compound hook by which the animal suspends itself in its dusky retreats, with its head downwards, during its long periods of hybernation. By this contrivance the burthen of its body is equally divided between each of the ten toes. But owing to the unequal length of the toes of the Pterodactyle, the animal must have found it well nigh impossible to range its claws uniformly in line, like those of the bat, and as no single claw could have supported for any long time the entire weight of the body, we are forced to the conclusion that the Pterodactyles did not suspend themselves after the manner of the flying Mammalia. From the size and form of the foot—from the size and shape, too, of the leg and thigh—we conclude that they had the power of standing firmly on the ground, where, with their wings folded, they possibly moved along after the manner of birds. They could also perch upon trees, and climb up the steep face of perpendicular cliffs, with their hind and fore feet conjointly, like bats and lizards.

It is supposed by Cuvier that they fed on insects, and that their habits were nocturnal. We know that large insects existed at the same time, large fossil *Libellulæ*, or Dragon-flies, and many other species, having been found in the strata which have given up to our examination the remains of these flying reptiles. Many of the smaller existing lizards are insectivorous; some are also carnivorous, and others omnivorous; but, according to Dr. Buckland, the head and teeth of two species of Pterodactyle are so much larger and stronger than is needful for the capture of insects, that we can scarcely come to any other conclusion than that they fed on fishes, darting upon them from the air, just as the solan goose or the sea-swallow catches its prey. The enormous size and strength of the head of the *Pterodactylus crassirostris* would not only have rendered it a formidable adversary to the piscine tribes, but also to the few small marsupial mammalia which flourished during the Liassic period.

Thus, then, while all "the laws of existing organization in the order of lizards" were strictly followed out and fulfilled in the Pterodactyles of the ancient world; still as lizards designed to move in the regions of the atmosphere like birds and bats, they received, in each part of their wonderfully constructed frame, a complete adaptation to this novel condition. Here we devoutly recognize the same foresight and care of a common Creator, which we perceive also in the marvellous mechanism of our own bodies, and in that of the myriads of inferior creatures whose "lords and masters" we style ourselves; a sufficient proof that the monstrous is nowhere an element of creation.

To sum up: the Pterodactyle, as a recent writer remarks, cannot fail to remind us of the dragon which played so conspicuous a part in classical and mediæval poesy, and figures in so many of the old legends of chivalry. It is an animal which might, indeed, respond to this fabulous type; but we see the dragon greatly curtailed in the paltry climbing and leaping reptile which lived in the Jurassic period. Among existing animals only a single reptile has been found supplied with wings, or digital appendages analogous to the membraniferous wings of the bats, and bearing a faint resemblance to the Pterodactyle. This is called the Dragon, or *Draconidæ*, a family of Saurians, hereafter described, distinguished by the first six ribs, instead of circling the abdomen, extending in nearly a straight line, and sustaining a prolongation of skin which forms a kind of wing like that of the Pterodactyle. Without assistance from the four feet, this wing sustains the animal like a parachute, as it leaps from branch to branch; but the creature has no power to beat the air with it as birds do during their aerial flights.

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* Milton, *Paradise Lost*, bk. ii. l. 947.

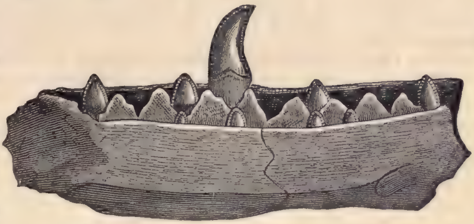
Returning to our general survey of the animal life of the Lias, we notice that in its strata fully two hundred and forty-three genera, and four hundred and sixty-seven species of zoophytes and molluscs have been discovered. Among the former we may particularize *Asterias lumbricalis* and *Palæocoma Furstembergii* as constituting a genus not unlike the Star-fishes (*Radiata*) of existing seas. The Encrinites were replaced by other species of the same genus, the *Astropecten*, the *Amphiura*, and the *Ophioderma*. Annelids, like the *Serpula;* barnacles, or *Pollicipes;* bivalve crustaceans, such as the *Cypris*, *Cypridea*, and *Estheria;* and the higher crustacea, *Eryon*, *Megacheirus*, and *Glyphæa*, were also abundant. The molluscan genera included the delicate polyzoans, or sea-mats, such as *Cenopora* and *Diastopora;* the deep-sea brachiopods, *Terebratula*, *Spirifera*, and *Discoria;* and some species of the oyster (*Ostrea*), which now first made its appearance. The sea-shores were thronged with the gasteropods, *Trochus*, *Turbo*, *Pleurotomaria*, and the like. Legions of belemnites and ammonites, also, swarmed in the warm waters of the Oolitic ocean.

That ocean also contained a great number of the fishes called *Ganoids;* that is to say, with hard glittering scales. One of the largest species was the *Lepidotus gigas.* We frequently meet with the teeth of the *Acrodus nobilis*, popularly known by the name of "fossil leeches," but never with its entire skeleton. The same is the case with the *Hybodus reticulatus.* The bony spines forming the anterior part of the dorsal fin of this fish, had long attracted the curious attention of geologists before their true character was ascertained, and had received the distinguishing appellation of *Ichthyodorulites.* By some naturalists they are conjectured to be the jaw of an animal; by others, the weapons, offensive and defensive, of a genus resembling the living *Silurus* or *Balistes;* but Agassiz has satisfactorily demonstrated that they were the bony spines of the fin, as in our modern genera of *Astraceins* and *Chimæras*, where the fin's concave face is similarly armed. The spines were simply embedded in the flesh, and attached by strong muscles, serving, as in the *Chimæra*, to raise or depress the fin; their action resembling that of a movable mast lowering backward.

But we must not omit a few details in reference to the gigantic land Saurians of the Oolitic era—the *Megalosaurus*, *Hylæosaurus*, and *Iguanodon;* or the insectivorous quadrupeds—the *Amphitherium*, *Phascolotherium*, *Stereognathus*, *Trionodon*, and *Plagiaulax*, which have been exhumed in the upper Oolitic formation.

The Megalosaurus,* or Great Lizard, was a terrestrial saurian, about forty feet in length. It seems to have combined many of the characters both of the iguana and the monitor; the latter a lacertian reptile which flourishes in tropical India and on the banks of the Nile. That it was carnivorous in its habits is evident from the complicated structure and arrangement of its teeth, which may be described as a compound of the knife, the sabre, and the saw.

"When first protruded above the gum, the apex of each tooth presented a double cutting edge of serrated enamel. In this stage its position and line of action were nearly vertical, and its form like that of the two-edged point of a sabre, cutting equally on each side. As the tooth advanced in growth, it became curved backwards, in the form of a pruning knife, and the edge of serrated enamel was continued downwards to the base of the inner and cutting side of the tooth; whilst, on the outer side, a similar edge descended, but to a short distance from the point, and the convex portion of the tooth became blunt and thick, as the back of a knife is made thick, for the purpose of producing strength. The strength of the tooth was further increased by the expansion of its sides. Had the serrature continued along the whole of the blunt and convex portion of the tooth, it would, in this position, have possessed no useful cutting power; it ceased precisely at the point beyond which it could no longer be effective. In a tooth thus formed for cutting along its concave edge, each movement of the jaw combined the power of the knife and saw; whilst the apex, in making the first incision, acted like the two-edged point of a sabre. The backward curvature of the full-grown teeth enabled them to retain, like barbs, the prey which they had penetrated. In these adaptations we see contrivances which human ingenuity has also adopted in the preparation of various instruments of art."



Jaw of the Megalosaurus.

We have hitherto been treating of carnivorous reptiles; but there were species of the same great family, in the Oolitic period, which assumed the character and office of Herbivora. Such was the *Iguanodon*, whose fossil remains were first discovered by Dr. Mantell in the Wealden fresh-water deposits of Tilgate Forest,

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* From μεγαλος, great, and σαῦρος, lizard.

Sussex. From the similar construction of the teeth of this ancient genus with that of the teeth of the modern iguana, there can be no doubt of their near connection. But while the iguana rarely exceeds five feet in length, its congener of the Oolitic period must have been nearly five times as long. Its thigh-bone exceeded in bulk that of the largest elephant! Presenting a circumference of twenty-two inches in its smallest part, its entire length must have been between four and five feet. If we compare the proportions of this colossal bone with those of the animal's fossil teeth, we find that they bear to one another nearly the same ratio which the femur of the iguana bears to its similarly-constructed and peculiar teeth. We thus obtain a standard of comparison which justifies us in estimating the dimensions of the *Iguanodon* as follows* :—

Length from snout to extremity of the tail, . .	70	feet.
Length of tail, ...	52½	"
Circumference of body, ...	14½	"

The teeth of the *Iguanodon* were not lodged in distinct sockets, like those of crocodiles, but fixed, like those of lizards, along the internal face of the dental bone, to which they adhered by one side of the bony substance of their root.

As the reptile fed upon tough vegetable food, its teeth were admirably fitted for this purpose by their cutting edges, form of curvature, and points of enlargement and contraction. They were each furnished with a sharp serrated edge, extending on either side downwards to the broadest portion of the body of the tooth, and thus preserving its utility until worn down to the very stump. To compensate for the gradual destruction of this serrated edge, a plate of thin enamel was placed on the front of the tooth. As the softer material of the tooth itself must have worn away more readily than this enamel, and most readily at the part remotest from it, an oblique section of the crown was constantly maintained with a keen-cutting front edge, not unlike (if the reader will permit the comparison) that of a pair of strong iron pincers, or nippers.

The structure of the skeleton is remarkable. The head, it is evident, must have been produced into a short snout, supporting a nasal horn. The vertebral column in some respects might be compared to that of a fish, but was distinguished from it by its lofty mural arches. The sacrum, wholly unlike that of any other reptile, consisted of five anchylosed joints. The body did not creep upon the ground, but was raised above it by long and robust limbs; each terminating in a three-toed foot, about twenty-one to twenty-four inches in height, and nine and-a-half to ten inches in breadth. The huge tridactyle impressions discovered in the argillaceous Wealden beds, and long supposed to have been produced by some colossal bird, are considered by some geologists to be the footprints of the *Iguanodon*. Professor Huxley has recently sought to prove, and with considerable success, that they were produced by the *Pterodactyle*.

Another large and singular Oolitic reptile, found in the Wealden strata of Kent and Sussex, has been named the *Hylæosaurus*, or Forest-lizard. From the fragments exhumed at different times, and in different localities, we gather that it was herbivorous in its habits; with a broad long body, terminating in a long, flexible, slender tail, and resting on short but solid limbs; a tuberculated and scaly skin; small, close-set teeth; and a ridge, or crest, along the back, of thin angular, bony spines. This dermal fringe reminds the naturalist of the horny crest on the back of the iguana. They varied in height from five to seventeen inches, and in width from three to seven and-a-half inches at their base.

This extraordinary lizard was probably about twenty-five feet long. Only one species has been discovered, which is known by the scientific appellation of *Hylæosaurus Oweni*.

Contemporary with these strange reptilian forms were certain mammals of a peculiar type, as, for instance, the *Amphitherium*, which is supposed to be the most ancient representative of its order on the globe. Cuvier first determined, from the examination of the jaw of a fossil specimen, that it was a marsupial; whence another French naturalist proposed to call it *Thylacotherium*, or Pouched Wild-beast, while *Phascolotherium* was also suggested as a suitable designation. Its present name, given by Blainville, has been adopted by Professor Owen, and, on his authority, by most English writers. From the structure of its teeth it would seem to have lived upon insects; and remains of beetles occur in the Oolitic slate of the Stonesfield quarries, where it was first discovered.

Two species of this interesting mammal have been distinguished.

The *Phascolotherium* is now acknowledged as a distinct genus, whose fossil relics were also first found, like those of the *Amphitherium*, in the Stonesfield quarries of Oxfordshire. It is only known by the jaw, preserved in the British Museum, but was undoubtedly a marsupial animal, and in structure and habits closely analogous to the living marsupials of Australia.

Before quitting the Oolitic strata we must refer to its remains of Fishes, Molluscs, and Zoophytes.

Among the Fishes the predominant types were the Ganoids and Ophiopsis. Among the Ammonites we meet with *Ammonites*, *Humphrysianus*, *A. bullatus*, *A. Brongniartii*, *Nautilus lineatus*, and many other representatives of the Cephalopods. *Terebratulæ* still flourished, and among Gasteropods the *Pleurotomaria conoidea* was remarkable for the elegance of its shape and the variety of its markings. Among the Acephala were the *Ostrea Marshii* and *Lima proboscidea*, and the species of molluscous Polyzoa were as numerous as they were beautiful. Echinoderms and Polyps swarmed in the warm genial seas; most noticeable among the latter, the *Eunomia radiata*.

This strange zoophyte is found in great masses many feet, nay, yards in circumference; each mass containing myriads of the animal, and implying a long series of years to account for its formation. The *Eunomia* lived under the waters, but only at a comparatively small depth below their surface, and in this position accumulated large far-stretching banks and entire islets, which at one time rose above the rolling waves. These reefs, however, were principally constructed in the Jurassic period, and their number and extent are one of the characteristics of that age, or *æon*. A similar phenomenon continues in our own time through the never-ceasing labours of the corallines, whose operations, as shown in the *atolls* of the Pacific, may be destined one day to create a new continent.

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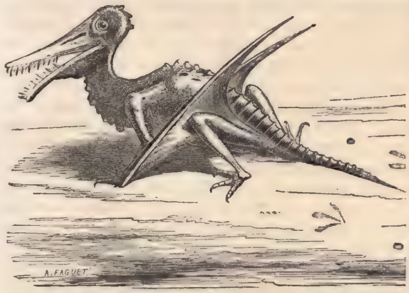
* Professor Owen, however, disputes these conclusions, and places the entire length of the *Iguanodon* at not above twenty-eight feet.

We pass now to the sub-period known as the Middle Oolitic. Then first appeared on the fluent earth certain new types of hemipterous insects, and the Bees wandered from flower to flower in quest of honied treasures. Then, too, among the *Lepidoptera*, came the bright glancing wings of the Butterflies, and among the *Neuroptera*, the sparkling Dragon-flies shot through the warm air like sparks of light. The Pterodactyle still perched on its leafy boughs; in the ocean-waters roamed the voracious Ichthyosaurus and Plesiosaurus; on the marshy shore wallowed the huge Megalosaurus; the gigantic Chelonia haunted the river banks, and the woods and plains were tenanted by Iguanodons, Amphitheria, and Phascolotheria.

At this epoch, moreover, flourished a reptile allied to the marvellous and apparently anomalous Pterodactyle. This was the *Ramphorhynchus*, distinguished from the latter by its long tail. In size it resembled the existing crow. Its powers of flight, however, were very limited; it did not really fly, but making use of the natural parachute formed by the membrane which connected its fingers with its body, it flung itself from a height upon its prey.



Ramphorynchus restored. One quarter natural size.

Of another family of reptiles, abundant in the Middle Oolite, we had a glimpse in the earlier age of the Great Oolite, the *Teleosaurus*, which a German writer has described as "the great baron of the kingdom of Neptune, armed to the teeth, and clothed in an impenetrable panoply; the true pirate or freebooter of the primeval seas."

In its anatomical structure it bore a close resemblance to the existing Gavial, or Gangetic crocodile, but certain modifications peculiarly adapted it for a marine life. Both surfaces of the vertebræ were slightly concave. Its hind legs were singularly large and strong, the anterior portion of its huge body tapered off with long slender jaws bristling with a formidable array of sharp teeth, slightly recurved, and admirably fitted for the capture of its fishy prey. The nasal aperture, instead of being oblique, as in the crocodile of the Ganges, opened vertically on the truncated end of the upper mandible.

The *Teleosaurus* was about thirty feet in length, of which the head consumed some three or four feet. Its colossal jaws were well protected beyond the ears, and yawned sometimes, with an opening of six feet, through which it could entomb, in the depths of its huge palate, animals of the size of an ox. Its body was protected by a cuirass, both on the back and belly. Twenty species of the *Teleosaurus* have been described, and these exhibit so many distinctive characteristics that they have been arranged into six sub-genera.

At the same time the seas teemed with fishes, with Crustaceans, Cirripedes, Molluscs, and Zoophytes. Passing from these to the Polyps, we are astonished at their abundance, and are inclined to regard them as peculiar, in the main, to the Oolitic age. They are discovered in vast aggregated masses at a considerable depth beneath the soil. Of old they played the same part in the economy of creation which in our own day is played by the coral animals. To a certain extent their mode of production must always remain a problem, but a flood of light has recently been thrown upon this interesting subject through the exertions of Charles Darwin. Describing what he believes to be a sea-pen (*Virgularia Patagonica*), he says:—

"The zoophyte consists of a thin, straight, fleshy stem, with alternate rows of polypi on each side, and surrounding an elastic stony axis. The stem at one extremity is truncate, but terminates at the other in a vermiform fleshy appendage. The stony axis which gives strength to the stem may become at this extremity a mere vessel, filled with granular matter. At low water hundreds of these zoophytes may be seen projecting, with the truncated end upwards, a few inches above the surface of the muddy sand. When touched or pulled they suddenly draw themselves in, so as nearly or quite to disappear. By this action the highly elastic axis must be bent at the lower extremity, where it is naturally slightly curved; and I imagine it is by their elasticity alone that the zoophyte is enabled to rise again from the mud. Each polypus, though closely united to its brethren, has a distinct mouth, body, and tentacula. Of these polypi in a large specimen there must be many thousands. Yet they act by one movement. They have also one central axis, connected with a system of obscure circulation."

In the sub-period of the Upper Oolite flourished some marsupial mammals of the genus *Spalacotherium*. Among the huge griffins with sharp, trenchant teeth, was the *Pœcilopleuron;* among the crocodiles, the *Macrorhynchus;* among the chelonidæ, the *Emys* and *Platemys*. And then appeared the first type of bird-life on the globe, the *Archæopteryx*, or Bird of Solenhofen, as it is sometimes designated, from the locality where its fossil remains were discovered.

Such were the principal forms of animal life which inhabited our world during the Liassic period. How strange, how impressive must the scene have appeared? If it could be reproduced before our eyes in all its actual vividness, in all its exuberant vigour, and with all its glowing hues, we should stand silent with awe and wonder! Strange birds wandered over the sandy shores or waded through the silt and mud of the estuaries; huge reptiles lurked among the herbage in quest of prey; horrible vampire-like pterodactyles whirled and veered from tree to tree; gigantic crocodiles basked in the shallow waters; and huge tortoises loitered in the recesses of lonely islands. Shark-like genera of fishes swarmed in the seas, defending themselves with their bristling fin-spines against the attacks of the ocean monsters, or crushing their crustacean victims between their corrugated teeth. But of these we have already spoken. What shall we say of the vegetation of the period? The continents, then slowly rising above the waters, were enriched with a prodigality of verdure of which the earth in our own days nowhere presents an example or a counterpart. The atmospheric and climatic conditions then prevailing were highly favourable to this luxuriance. The temperature was still of great elevation; the atmosphere humid, with frequent rains and mists; and when these passed away a glorious sun shone in a cloudless burning sky. The Voltzias of the Trias have disappeared, but the palms have grown more numerous, and convert the forest glades into still, shadowy avenues of graceful columns; the gigantic calamites likewise remain; and though the arborescent ferns have lost the enormous dimensions of their predecessors in the Carboniferous period, they preserve their fine and delicately chiselled leaves.

An entire family, the Cycads, now make their first appearance, and develop themselves in three predominant genera—the Zamites, the Pterophyllum, and the Nilssonia. The trunk of the Zamites, simple, and covered with the scar-like memorials of old foliage, supports a thick crown of leaves, more than six feet in length, which are disposed like plumes around a common centre.

The Pterophyllum is a tall, robust tree, clothed in large pinnated leaves from top to bottom. Their thin membranous leaves, trembling in the lightest breeze, are provided with truncated leaflets, traversed by fine nervures, not convergent, but all abutting on the terminal truncated edge.

The Nilssonia somewhat resembles the Pterophyllum, but its leaves are thick and leathery in texture, with short leaflets contiguous, and, in part, attached to the base; at the summit they are truncated, or, more correctly speaking, obtuse, with nervures arching or confluent towards that summit.

But let us picture to ourselves the Liassic world, not with its forests of cycads and conifers, its masses of ferns and equiseta, its rolling rivers, or its tepid marshes; let us call up before our inner vision the billows of the seething ocean, with a dull, cloudy heaven bending over them, and the ichthyosaurus and the plesiosaurus contending for their prey. The latter arches its long neck to pounce suddenly on its mighty antagonist, which spouts from its blow-holes, like our modern whale, incessant jets of water, mucus, and vapour (Plate 3). *

We may next permit ourselves a glance at the flora of this period. As in the Triassic age, terrestrial vegetation mainly consisted of ferns, cycads, and conifers. The first was represented by the Pachypteris microphylla, the second by the Zamites Moreana; among the conifers were conspicuous the Brachyphyllum Moreanum and Brachyphyllum majus. We find palms, lilies, and similar monocotyledonous plants largely on the increase; and dicotyledonous types exhibiting themselves in fragments of wood, leaves, and inflorescence. This change in the character of the terrestrial vegetation was necessitated by the change which had taken place in the conditions of our planet. The seas were more connected, and showed a tendency to spread southward, while the land assumed a more continental aspect, and the channels of the great rivers and the boundaries of inland lakes became more closely defined.

Of the marine flora our knowledge is imperfect. Aquatic plants, not unlike the pond-weeds of our own days, seem to have flourished abundantly. Among the cryptogams, equiseta (or mare's-tails) and lycopods (or club-mosses) still preserved their vitality. Tree-ferns, such as the Sphenopteris, Tæniopteris, and Peropteris, accumulated in warm humid places; while coniferous trees began to predominate in the forests. So nearly do these resemble, in many important respects, the cypresses, araucarias, screw-pines, yews, and thujas of New Zealand and other southern regions, that they have received botanical names indicative of these affinities—cupressites, araucarites, pinites, taxites, and thujites. Just such a landscape as a modern naturalist shows us in the neighbourhood of Parà (in Brazil),* we may imagine to have been frequent enough in the Middle Oolitic globe:—"We found ourselves," he says, "in a moderately broad pathway, or alley, where the branches of the trees crossed overhead and produced a delightful shade. The woods were at first of recent growth, dense, and utterly impenetrable; the ground, instead of being clothed with grass and shrubs as in the woods of Europe, was everywhere carpeted with Lycopodiums (club-mosses). Gradually the scene became changed. We descended slightly from an elevated, dry, and sandy area to a low and swampy one; a cool air breathed on our faces, and a mouldy smell of rotting vegetation greeted us. The trees were now taller, the underwood less dense, and we could obtain glimpses into the wilderness on all sides. The leafy crowns of the trees, scarcely two of which could be seen together of the same kind, were now far away above us, in another world, as it were. We could only see at times, where there was a break above, the tracery of the foliage against the clear blue sky. Sometimes the leaves were palmate, or of the shape of large outstretched hands; at others, finely cut or feathery, like the leaves of Mimosæ. Below, the tree trunks were everywhere linked together by sipos; the woody, flexible stems of climbing and creeping trees, whose foliage is far away above, mingled with that of the smaller independent trees. Some were twisted in strands, like cables; others had thick stems contorted in every variety of shape, entwining snake-like round the tree trunks, or forming gigantic loops and coils among the larger branches; others, again, were of zig-zag shape, or indented like the steps of a staircase, sweeping from the ground to a giddy height."

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* Such is the opinion of Bayle, but we do not think it is held by the best living palæontologists.

* Bates, The Naturalist on the Amazons.

Some such scene, allowing for differences of form and colour, and a more monotonous vegetation, we may fancy to have been presented by a Middle Oolitic landscape.

Let us suppose that we have made our way through this dense growth of cycads and conifers, palms and ferns, and are standing on the brink of a limestone cliff, looking out afar upon a wide expanse of sea. The animal life that meets our gaze, and which our artist has endeavoured to reproduce in the engraving (Plate 4), greatly differs from any of the forms to which we are now accustomed. The strange, cuirassed, crocodile-like creature that has just emerged from the waves and advances towards us, carrying in its mouth a freshly captured victim, is the *Teleosaurus*, and its prey a *Geotheutis*, a kind of calamary. The teleosaurus, as already stated, carried a coat of mail both on back and belly, and of this we are made certain by the dead monster floating on its back in the shallow water, and so exposing its ventral cuirass.

At the foot of the cliff, where it slopes towards the beach, stands a *Hylæosaurus*—a great land-saurian—with bristling back, whose numbers, as yet, are very limited.

The tide is up, but if we waited until it receded we should find the shore covered with animal life—nautilus and ammonite, turbo, nerinæa, and pleurotomaria; pecten, ostrea, and avicula; encrinites, and legions of polyzoans.

Our artist has presented us in the accompanying illustration with an ideal landscape peculiar to the period we are now describing (Plate 5).

Rightly to understand its principal features, we must digress from the immediate subject of this chapter, and glance, as we have previously done, at the prevailing forms of vegetable life.

The terrestrial flora of the period consisted of ferns, cycads, and conifers; zosteræ flourished in the ponds and morasses. The zosteræ are monocotyledonous plants of the family of the Naiadaceæ, which thrive in the sandy mud of maritime or littoral regions, and form, with their long, narrow, and ribbon-like leaves, vast prairies of emerald green. These masses of verdure appear partly exposed at low tide, and provide nourishment and an asylum for numerous marine animals.

At Portland, on the Dorsetshire coast, the characteristics of the Oolitic vegetation may be examined by the student with peculiar facility. Its quarries reveal in section the strata of the primeval world. On the well-known Portland stone rests a bed of limestone formed in lacustrine waters; and on this bed another, of a dark bluish substance, which, on examination, is found to be a well-preserved vegetable earth or *humus*, resembling our vegetable soil, from fifteen to eighteen inches thick, and abounding in the silicified remains of conifers and other plants, analogous to the Zamia and Cycas. Herein the trunks of great numbers of silicified trees and tropical plants are found, standing erect, their roots struck deep into the soil.

"The ruins of a forest upon the ruins of a sea," says Esquiros, "the trunks of these trees were petrified while still growing. The region now occupied by the narrow channel and its environs had been at first a sea, in whose bed the Oolitic deposits which now form the Portland stone accumulated: the bed of the sea gradually rose and emerged from the waves. Upon the land thus rescued from the deep, plants began to grow; they now constitute with their ruins the soil of the dirt-bed. This soil, with its forest of trees, was afterwards plunged again into the waters—not the bitter waters of the ocean, but in the fresh waters of a lake formed at the mouth of some great river."

We may now turn to our ideal landscape.

Among the tree-ferns we recognize the *Sphenophyllum* as still predominant in this vegetation, and investing it with an air of peculiar elegance.

No palms are visible, but in their place spring the tall stems of the pandanas, the zamites, and the branching conifers.

A coral islet rising above the azure waves, like a Polynesian atoll, reminds us of the importance now assumed by the labours of the coralline animals, which have ever played so conspicuous a part in the creation of our modern globe.

The animals represented are the *Crocodileinus*, the *Ramphorynchus*, and certain invertebrata, such as the Asteria, Comatula, Hemicidaris, Pteroceras. In the genial air flies the bird of Solenhofen, the Archæopteryx[*] which has been reconstructed from the skeleton; the head, however, has not been discovered. The footprints on the sand may be those of the ramphorynchus, or, perhaps, of the pterodactyle (Plate 6).

We now proceed to a consideration of the types of organic life peculiar to the Cretaceous period.

THE CRETACEOUS PERIOD.

The strata of the Cretaceous period, or the Chalk formations, form the upper strata of the Secondary series; and while resting upon the Oolite, are themselves the base of the Tertiary or more recent beds. They cover an extended area in Europe and the east of Asia, and have also been found in North and South America. In the south-east of England they occur in those rounded and grassy downs which are so characteristic a feature of Kent, Surrey, Sussex, Hampshire, Dorsetshire, and the Isle of Wight, and stretching along the coast in a line of lofty and glittering cliffs, to which England owes her ancient name of *Albion.* These beds are connected with similar beds in Denmark, Germany, and the north of France; and it is surmised, from the masses of chalk and flint thrown upon the shores of the Shetland Isles after a storm, that the bed of the German Ocean is composed of the rocks of this formation.

The strata are arranged by most geologists in the following order :—

UPPER.

	Maximum Thickness in Feet.
Maestricht, ...	100
Chalk with flints, ...	500
Chalk without flints, ...	600
Chalk marl, ...	100
Upper greensand, ...	100

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[*] See page 25.

LOWER.

	Maximum Thickness in Feet.
Gault,	150
Lower greensand,	850
Wealden beds,	1800

The Maestricht beds consist of pisolitic limestones* in the north of France, and of loose yellowish sandstones in Holland.

The chalk with flints abounds in the south-east of England, the flints occurring in long parallel lines of remarkable regularity; so that a section of the rock, viewed from a distance, looks as if it had been scored with the help of a ruler. The limestone is of a pure white, pulverulent quality; and as it is usually too soft for building purposes, is chiefly quarried for the lime-kilns. The layers of flints never exceed a few inches in thickness. They are often found in nodules at intervals of from two to four feet. Iron pyrites is frequently met with in radiated nodules, which readily decompose, and colour the rock with rusty hues, as if from a chalybeate spring.

Chalk without flints differs from the upper chalk only in the absence of the flints.

Chalk marl is the white chalk indurated by a gradual admixture of argillaceous matter, and transformed, as it were, into a "pale, buff-coloured marl," or argillaceous limestone, generally of sufficient firmness and hardness for the builder's use.

The upper greensand is composed of alternating layers of sands, clays, and limestones, frequently coloured green, as its name indicates, by the presence of a chloritic mineral.

Gault is a dark tenacious clay used for brickmaking. Its occurrence between the strata of the chalk is a cause of the numerous landslips that occur on the southern coast and in the Isle of Wight. The action of subterraneous springs reduces it to a soft consistent state, and it then oozes gradually through the chalk, whose upper strata are consequently precipitated forward. It is in this way the wild romantic region of the Undercliff, in the Isle of Wight, was formed.

The lower greensand resembles the upper in every particular.

The Wealden, which in England occupies a district of Kent and Sussex long known as the Weald, is divided into two groups, the Wealden clay and the Hastings sand. It consists of a series of shales and sandstones, in which some highly interesting fossil remains have been discovered.

From these brief remarks it will be seen that the characteristic feature of the Cretaceous formation is the chalk (*creta*), whence it derives its name. This chalk is a white, soft, and friable or pulverulent substance, almost wholly composed of limestone; the only foreign matter which occurs in any abundance being the silex, which forms its nodules or regular layers of flint. The question now arises, Of what does this chalk or limestone consist? Hitherto our remarks will have been of interest only to the geologist; but the question we have just proposed concerns the naturalist. For limestone consists of comminuted shells, such as Foraminifera, mixed with the disintegrated prisms of larger shells, Pinnæ, Cytherinæ, Diatomaceæ, and Entomostraceæ.

It is a difficult problem, says a distinguished geologist, to account for the source of the enormous masses of carbonate of lime that compose nearly one-eighth part of the superficial crust of the globe. Some have referred it entirely to the secretions of marine animals, and to such an origin we must obviously assign the Cretaceous strata composed of comminuted shells and corallines; but until it can be shown that these animals had the power of forming lime from other elements, we must suppose that they derived it from the sea, either directly or through the medium of plants.

In either case it remains for us to discover the source whence the sea obtained, not only these supplies of carbonate of lime for its animal inhabitants, but also the still larger quantities of the same substance that have been precipitated in the form of calcareous strata. It is impossible to suppose that it resulted, like sands and clays, from the mechanical detritus of the granitic rocks, because the quantity of lime which they contain bears no proportion to its large amount among the derivative rocks. The only remaining hypothesis seems to be "that lime was continually introduced to lakes and seas by water that had percolated rocks through which calcareous earth was disseminated."

The origin of these large quantities of silex which constitute the chert and flint beds of stratified formations, Dr. Buckland refers to the waters of hot springs, holding silicious earth in solution, and depositing it on exposure to reduced degrees of temperature and pressure, as silex is deposited by the hot waters of the Iceland geysers.

From these particulars the reader will infer that the Cretaceous formation abounds in fossils. Vegetable remains, indeed, are seldom met with, except in the Wealden beds, but all the divisions of the animal kingdom, except the warm-blooded vertebrata, occur in profusion. The marine fauna presents a copious abundance of Sponges (*Spongia*, *Siphonia*, and the like) converted into flints; whence Dr. Bowerbank suggests that their "mission" in the primeval world was to cause the deposit of silicious matter from the ocean waters, just as the corals induce the consolidation of its calcareous constituents. Foraminifera (as the *Textularia*, *Bulima*, and *Dentalina*) must have literally swarmed; the greater portion of the Cretaceous strata, as we have already remarked, consisting of their exuviæ. This period was, in fact, the noonday of foraminiferous life; it existed in hundreds of species and genera, which, flourishing through their brief career, afterwards covered the ocean bed for leagues upon leagues with their calcareous cases.

Corals were still met with, but not so plentifully as in the Oolitic seas. Radiata increased in number and developed in beauty, and among the most characteristic fossils of the period are the *Diadema*, the *Goniaster*, the *Galerites*, and other genera of Echini, or Sea-urchins. The exquisite lily-like forms of the Encrinites were now on the wane; but annelids, like the tortuous *Vermicularia* and winding *Serpula*, teemed in the still genial waters.

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* Pisolitic, from *pisum*, a pea, in reference to the size of the component parts.

In the Crustacea the principal existing genera would seem to have been the *Cytheris*, *Cythere*, and *Banilia;* among the Malacostraceans, those huge lobsters and sea-crabs known as the *Pagurus*, *Notopocorystes*, and *Myeria*.

A deservedly-popular writer shall complete for us the picture of Cretaceous life:—

It was now, he says, that the minute Polyzoa, or Sea-mats, wove their delicate tracery of network in a thousand forms (*Flustra*, *Eschara*, *Diastopora*, *Actinopora*, *Idmonea*), spreading it over corals, dead shells, and crustaceans, as if their function had been to shroud in beauty the worthless and decaying wreck of the Cretaceous sea-shore.

The higher Mollusca also appear in vast profusion—many of the Oolitic genera having departed or being on the decline, while other forms peculiar to the chalk begin to make their appearance. The deep-sea Brachiopods are represented by species of *Terebratula*, *Terebratella*, and *Rhynconella;* the true Bivalves by *Inoceramus*, *Lima*, *Ostrea*, *Pecten*, *Astarte*, *Cardium*, *Trigonia*, *Venus*, and many others, whose specific forms are new and peculiar to the period; while Gasteropods, like *Natica*, *Littorina*, *Cerithium*, *Rostellaria*, *Solarium*, *Pleurotomaria*, and others, mark a busy sea-shore of herbivorous and carnivorous activity.

The Cephalopods, though numerically fewer than in the Lias and Oolite, now appear in curiously fantastic forms. The chambers of the shell-clad genera had previously been straight as an arrow, like the *Orthoceras*, or coiled on the same plane, like the *Nautilus* and *Ammonite*. But now some of them appear bent like a hook (*Hamites*), curved like a boat's prow (*Scaphites*), incurved like a crosier (*Ancyloceras*), twisted like a ram's horn (*Crioceras*), spun round a straight axis, and tapering like a spire or a pagoda (*Turrilites*), or in some other fanciful and simulative guise. Examining these elegant memorials of the past, we are reminded of the poet's exclamation:—

"See what a lovely shell,
Small and pure as pearl,
Lying close to my foot;
Frail, but a work divine
Made so fairily well,
With delicate spire and whorl,
How exquisitely minute,
A miracle of design!
The tiny cell is forlorn,
Void of the little living will
That made it stir on the shore.
Did he stand at the diamond door
Of his house in a rainbow frill?
Did he push, when he was uncurl'd,
A golden foot or a fairy horn
Through his dim water-world?"

This abundance, this wonderful profusion of generic types, and that on the very eve of their decline, has originated numerous hypotheses. Those writers who consider the modification of form to depend upon physical conditions, suppose that certain obnoxious changes in the waters of deposit were the proximate causes of these fantastic and singular forms. "It is true," says Dr. Page, "that an influx of fresh water into a marine area, or *vice versâ*, is often attended by curious changes in the indwelling Mollusca, and that new conditions of cultivation produce strange *sports* among the varieties of the gardener; but the forms of these Cretaceous shells are too decisive and persistent to be otherwise explained than by supposing the introduction of new genera, in obedience to some great but unknown law of creation."

The fishes of the chalk formation include many of the old Placoids and Ganoids (the Sharks, Rays, and Sauroids) of the Oolitic, but with new and peculiar genera of the same great divisions; while for the first time the Ctenoids and Cycloids, which in our present seas are the prevailing orders of ichthyic life, make their appearance.

Among the Placoids the dominant genera were—*Ptychodus*, *Hybodus*, *Acrodus*, and *Lamna;* among the Ganoids—*Gyrodus*, *Pycnodus*, and *Macropoma;* among the Cycloids—*Osmeroides*, *Hypsodus*, *Saurocephalus;* among the Ctenoids—*Beryx* and *Berycopsis*.

We now turn to the Reptiles, and find a few species of the Plesiosaurus and Ichthyosaurus still dragging their huge bulk through the ocean waters. On the land an Iguanodon or two still crawls among the herbage, and from the sea-cliffs the ungainly Pterodactyles still essay their awkward, dropping flight. The Crocodiles, Lizards, and Turtles are represented by several genera; but it is evident that, on the whole, the meridian of reptile life is past, and that if the colossal types of the Oolitic are not wholly extinct, they are rapidly disappearing. Few and faint are the traces as yet discovered in the chalk of birds and mammals, and in this direction there remains much valuable and important work to be accomplished by the future geologist and palæontologist.

Our description of the series of Secondary strata may fitly conclude with Dr. Buckland's summary:—

The peculiar feature in the population of these series was, as he points out, the prevalence of numerous and gigantic forms of Saurian reptiles. Many of these were exclusively marine; others amphibious; others were terrestrial, ranging in savannahs and jungles, clothed with a tropical vegetation, or basking on the margins of estuaries, lakes, and rivers. Even the air was tenanted by flying lizards, under the dragon form of Pterodactyles. The earth was probably at that time too much covered with water, and those portions of land which had emerged above the surface were too frequently agitated by earthquakes, inundations, and atmospheric irregularities, to be extensively occupied by any higher order of quadrupeds than reptiles.

It is worthy of notice that, in the Cretaceous period, the forms of vegetable life begin to approximate very closely to those which now obtain. The types may now be recognized of the maple, the alder, the walnut, the wych-elm, and other dicotyledons; and the palms include several species which differ but little from those now flourishing under tropical skies.

"As we retire from the days of the primitive creation," says Lecoq, "and gradually approach those of our own era, the sediments seem to withdraw themselves from the polar regions, and we find them restricted to the temperate or equatorial zones. The great beds of sand and limestone constituting the Cretaceous formation, announce a condition of things very different from any that has hitherto prevailed. No indications of central heat now mark the seasons; already zones of latitude show signs of their existence; already the biological relations of living beings are such as man can understand, and vegetation assumes a truly peculiar form."

Prior to this epoch two classes of vegetation have predominated—the cellular cryptogams at first; and secondly, the dicotyledonous gymnosperms. But now, in the transition age of vegetation, these two classes begin to fail, and a third, the dicotyledonous angiosperms, "timidly take possession of the earth;" consisting, primarily, of a small number of species, and occupying only a limited portion of the soil. In later periods, as in our own times, we shall find their supremacy firmly established.

Some arborescent ferns still maintain their position, and the graceful *Protopteris Singeri* and *Protopteris Buvigneri* unfurl their light fronds, like banners, to the breeze. Some *Pecopteri*, differing from the Wealden species, flourish in their company. Zamites, and cycads, and Zamiostrobi prove that the temperature of the Cretaceous period was still almost tropical. New varieties of *Palmaceæ* reveal themselves, and among others, the *Flabellaria chamæropifolia* is distinguished by the majestic diadem at its summit.

The conifers have withstood the lapse of time and the influence of change more successfully than the cycadeæ; then, as now, they were gathered together in vast forests, where *Damarites*, *Cunninghamias*, *Araucarias*, *Eleoxylons*, *Abietites*, and *Pinites* remind us of numerous forms still existing, but distributed all over the earth.

From this epoch, moreover, date the *Comptonias*, a genus of the natural order *Myricaceæ;* the *Almites Fresii*, a member of the *Betulaceæ;* the *Carpinites arenaceus*, which is one of the *Cupuliferæ;* the *Salicites*, now represented by the long, drooping, arborescent willows; the *Aceritis cretaceæ*, belonging to the *Acerinæ;* and the *Juglandites elegans* to the *Juglanditæ*.

But unquestionably the most interesting botanical event of this period is the advent of the *Crednaria*, with its triple-veined leaves, of which no less than eight species have been found and described, but whose place in the scientific systems of classification remains undetermined. The Crednarias, like the Salicites, were certainly trees, as were most of the species of this remote epoch.

These details will enable the reader to understand the accompanying illustration (Plate 7), in which our artist has presented a landscape of the Cretaceous period. Through an opening in the dense wood we obtain glimpses of the radiant heavens beyond; and we can imagine the sunlight playing upon the quaint, vigorous foliage of the pillared trees, and tipping with golden hues the feathery fronds of the ferns. Tall palms in the distance wave in the passing wind their fan-shaped leaves, which ever and anon droop like the plumes of a knightly crest in the rush of battle. Rich grasses and exquisite mosses clothe the living sward, and the murmur of insects fills the air, their monotonous hum being occasionally interrupted by the crash of an aged tree in a distant forest glade, or the cry of some listless, lizard-like reptile, or the hoarse roar of ignanodon and megalosaurus, as they engage in furious combat. Leaving these huge monsters to contend for supremacy, we wander far away into a still and shadowy avenue, where the walnut, the maple, and the alder rear their well-known trunks. We note with surprise a vegetation at once temperate and tropical, but feel that the temperature, if fresh, is also genial, and admirably adapted to the growth of the more vigorous forms of vegetable life. And so we bid adieu to the ideal solitudes of the Cretaceous forest.

THE TERTIARY SYSTEM.

Also called the Cainozoic, or Recent Life Period.

With the Tertiary series we enter upon the consideration of an order of entirely new phenomena, presenting formations in which the remains of animal and vegetable life gradually approximate to the species of our own epoch. We are in the position of a traveller who, after long wandering through remote and previously unknown landscapes, finds himself rapidly approaching his own home, and everywhere recognizes the features of a familiar scenery.

For the convenience of comparison the Cainozoic is usually subdivided into Eocene, Miocene, Pliocene, and Pleistocene; words of Greek origin which respectively signify the earliest, less recent, more recent, and most recent life-stages. But the reader must remember that these distinctions are entirely arbitrary, and that no definite line of demarcation has been drawn between them by the hand of nature. There are not vast impassable gulfs separating the one period from the other. The animal and vegetable forms of the Eocene pass into the Miocene, and are even protracted into the Pliocene; and no error could be more disastrous than to suppose that either of these divisions represents, as it were, a sole and independent world, with a fauna and a flora entirely its own. To return to a previous image, the palæontologist, in tracing the growth and development of created life, is like a traveller who passes from the icy regions of the north into the glowing and luxuriant climes of the south. In so doing he traverses numerous countries, not separated by any conspicuous barrier or boundary, but gradually melting into one another, so that the transition is everywhere accomplished without any sudden or violent change.

As we have said, the term Eocene implies the earliest stage, or *dawn* of the existing state of the animal creation, and the strata of this series contains but a very small proportion of shells referrible to living species.

As types of these series we shall take the London clay and the Calcaire grossier, or marls and gypsums of the Paris basin. For a detailed account of their nature and relations we are indebted, primarily, to the exhaustive labours of Cuvier and Brongniart.

After describing how slowly the cabinets of Paris had been filled with innumerable relics of unknown animals, exhumed from the gypseous beds of Montmartre, Cuvier graphically describes the manner in which he addressed himself to the task of making these "dry bones" live, of reconstructing from apparently shapeless fragments the complete and perfect skeletons.

Having speedily recognized the existence of numerous species, belonging to many distinct genera, "I at length found myself," he says, "in a kind of charnel-house, surrounded by the mutilated debris of hundreds of skeletons, of more than twenty separate orders, all piled around me in confused heaps: it was my task to restore them to their original position. At the voice of comparative anatomy every bone, and every fragment of a bone, fell into its appointed place. I cannot describe the pleasure I experienced in seeing, as I discovered one character, how all the consequences which I predicted from it were successively confirmed; how the feet were found to correspond in detail with the facts ascertained from the teeth; how the teeth were in harmony with those indicated beforehand by the feet; how the bones of the legs and thighs, and every connecting portion of the extremities, were set together precisely as I had conjectured, before my conjectures were verified by the discovery of the parts entire: in short, how each species was, as it were, successfully reconstructed from a single one of its component elements."

The character of the animal life of the Eocene stage may be readily understood from a glance at the subjoined

LIST OF VERTEBRAL ANIMALS FOUND IN THE PARIS BASIN.

Extinct Species of Extinct Genera.

Pachydermata:—
Palæotherium, Anoplotherium, Chæropotamus, Adapis.

Extinct Species belonging to Existing Genera.

Carnivora:—
- Bat.
- Canis (large wolf, differing from any existing species), fox.
- Coatis (*Nasua*), large coati, now inhabiting the tropical regions of America.
- Racoon (*Procyon*), North America.
- Genette (*Viverra Genetta* of Linné, *Genetta* of Cuvier), now extending from Southern Europe to Cape of Good Hope.

Marsupialia:—
Opossum, small (*Didelphis*), allied to the opossum of North and South America.

Rodentia:—
Dormouse (*Myoxus* of Gmelin), two small species; squirrel (*Sciurus*).

Birds:—
Nine or ten species, referrible to the following genera:—Buzzard, owl, quail, woodcock, seaback, curlew, and pelican.

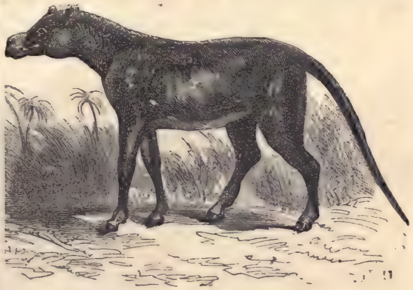
Reptiles:—
Fresh-water tortoises, trionyx, emys, crocodile.

Fishes:—
Seven extinct species of extinct genera.

A remarkable feature in this list is the numerical preponderance of Pachydermata among the earliest fossil Mammalia, beyond the proportion they bear among existing quadrupeds; and it will be observed that they supply, from the relics of a former world, many intermediate forms wanting in the present distribution of that important order. "As the living genera of Pachydermata," remarks our authority, "are more widely separated from one another than those of any other order of Mammalia, it is important to fill these vacant intervals with the fossil genera of a former state of the earth; thus supplying links that appeared deficient in the grand continuous chain which connects all past and present forms of organic life as parts of one great system of creation."

We proceed to a brief description of the principal pachydermatous species; of those curious creatures, simulating every form—tapir, llama, rhinoceros, sea-cow, hog, antelope, ass, and camel—and apparently fulfilling the various functions now assigned to those later families, which roamed at will in the dense forest, and over the grassy plain, and along the reedy, swampy bank of rolling river and ample lake, during the early ages of the Cainozoic period.

*The Anoplotherium.**—This genus was established by Cuvier from bones discovered in the Eocene strata, near Paris; but its remains have also been found in the same strata in the Isle of Wight, and elsewhere. The animal's teeth are wholly unlike those of any other pachyderm, past or present. They are arranged as in the human jaw, in a continuous series without intervals—a circumstance distinguishing the Anoplotherium from all quadrupeds; and consist of six incisors, two molars, two canines, eight pre-molars, and six molars in each jaw. The upper molars are quadrangular; the lower marked with prominent ridges of enamel. It is supposed that the Anoplotherium was partly carnivorous in its food. It had no proboscis, nor was its snout considerably elongated. The feet, as in the Ruminantia, terminate in two toes, but have always separate metacarpal and metatarsal bones. Numerous species have been discovered, varying in size from that of a small ass to that of a guinea-pig; whence it is evident that the smallest species must have been more diminutive than any known hoofed quadruped. As great a difference prevailed in shape and appearance, some having graceful forms and slender limbs, others being solidly and even inelegantly built. A few would seem to have been adapted for a purely aquatic life; but the Anoplotherium proper was, in all probability, the type, in manners and habits, of the modern tapir.



Anoplotherium commune. One-twentieth natural size.

The recognized genera are:—*Dichodon*, *Dichobuné*, *Microtherium*, and *Xiphodon*.

The *Adapis*, in form, resembled the hedgehog, but was three times its bulk. Dr. Buckland is of opinion that it formed a link connecting the Pachydermata with the insectivorous Carnivora.

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* From the Greek, α privative; 'οϖλον, armour; and θεϱιον beast.

The *Chæropotamus* is a genus of Pachyderms, founded by Cuvier on fossil remains associated in the Paris basin with those of the Anoplotherium and Palæotherium. Some remains have also been discovered at Winstead, near Ryde, in the Isle of Wight. This interesting animal seems to have been closely allied to the Peccaries which now inhabit the virgin forests of Equatorial America. According to Professor Owen, in the structure of some of their teeth, and the conformation of their lower jaw, they approximate decidedly to the ferine type. Alluding to the carnivorous propensities of our common hog, he points out that the extinct Chæropotamus was still better adapted by its dentition for predaceous habits, and pronounces it "an interesting example of one of those links, completing the chain of affinities, which the revolution of the earth's surface have interrupted, as it were, and for a time concealed from our view." He adds, that it is curious to notice that the living sub-genus of the family to which the Chæropotamus is most nearly allied, is an inhabitant only of South America, where the llama and the tapir, the nearest living analogues of the anoplotherian and palæotherian associates of the Chæropotamus now exist, and which was formerly the native habitat of a genus, *Macrauchenia*, connecting the llama with the palæothere.

Palæotherium magnum restored.

Dr. Buckland is of opinion that the Chæropotamus, in some respects, resembled the Babiroussa (*Sus Babirussa*), a gregarious animal, found in the wooded islands of the Indian Archipelago.

The *Palæotherium*, or ancient wild beast, in general appearance resembled the tapir, especially in having the snout terminated by a short proboscis. It was characterized by the following arrangement of teeth:—

Incisors.	Canines.	Pre-molars.	Molars.
$\frac{3-3}{3-3}$	$\frac{1-1}{1-1}$	$\frac{4-4}{4-4}$	$\frac{3-3}{3-3}=44.$

It had three toes on each foot, each terminated by a hoof. Like the tapir, it frequented the banks of rivers and large lakes, was nocturnal in its habits, and lived upon herbivorous food, such as fruits, buds, and the young shoots of trees.

Eleven or twelve species of the Palæotherium have been discovered; some as large as a rhinoceros, others varying from the size of a hog to that of a horse.

The *Lophiodon* is another extinct genus of Pachyderms, allied most nearly to the tapir and rhinoceros; in some respects, to the hippopotamus; and in others to the *Palæotherium* and *Anoplotherium*. Fifteen species of Lophiodon have been distinguished.

The *Hyracotherium* is a pachydermatous genus, belonging to the division Perisodactyla, the animals of which are characterized by possessing an uneven number of toes. It was founded by Professor Owen on the remains of two species discovered in the Eocene strata. A third species was afterwards exhumed from the Roman cement bed of the London clay, near Harwich. This fossil consisted of an entire skull, of the right humerus and femur, the left femur (nearly complete), the left tibia, three metatarsal bones, and fragments of the vertebræ, ribs, and pelvis. The head, which was slender and tapering, like that of the existing tapir, measured five inches in length, and a little more than two inches in breadth. Its straight contour, and the conformation of the nasal aperture, allied the animal to the horse and the hyrax. From the structure of its teeth, it is evident that its habits were herbivorous, while the form and proportions of its limbs were midway, so to speak, between the hyrax and the tapir.

The three species at present known are called respectively the *Hyracotherium* (or *Pliolophus*) *vulpiceps*, *Hyracotherium leporinum*, and *Hyracotherium caniculus*. This latter species was founded on several teeth belonging to a smaller animal than the others, discovered in the Eocene sand at Lynn in Suffolk. They were considered by Professor Owen to belong to a quadrumanous animal, which he named *Macacus eocænus*, and described as "at once the first terrestrial mammal found in the London clay, and the first quadrumanous animal hitherto discovered in any country in tertiary strata so old as the Eocene period." On further examination, however, our great palæontologist recognized that the two teeth belonged, not to a monkey, but to a third species of Hyracotherium.

The *Anthracotherium* was so called because first discovered in the Tertiary coal, or anthracite, of Cadibona in Liguria. It presents seven species, some of them approximating in size and character to the hog, others more nearly approaching the hippopotamus.

While the Eocene sub-period was thus prolific of pachydermatous forms, it nourished in its seas, and estuaries, and rivers, a vast number of new types of life. Then first appeared the corresponding species of our existing Lymneæ, Paludinæ, Planorbes, and other fresh-water shells. The terrestrial snails, Helix, Pupa, Clausilia, and the like, so rare in earlier epochs, now became abundant. The gasteropods and cephalopods increased in number and variety, and the ocean waters swarmed with busy legions of foraminiferous organisms, whose destiny it was to build up immense masses of nummulitic limestone, rivalling in extent and thickness the coral reefs of the present day.

Of the shells of the cephalopodous molluscs belonging to the tertiary formations, D'Orbigny distinguished between six hundred and seven hundred species. The only genus which our limits will allow us to notice is the *Nummulite*, so named from the resemblance of the animal to a piece of money. In size it varied from that of a crown piece to microscopic minuteness. It occupies an important place in the history of fossil shells on account of the prodigious numbers in which it is found accumulated in the tertiary strata—often piled upon one another in as close contact as the grains in a heap of corn. In this state the Nummulites form a considerable portion of the entire bulk of many lofty mountains; as in the tertiary limestones of Verona and Monte Bolen, and in secondary strata of the Cretaceous period in the Pyrenees, Alps, and Carpathians. Some of the Pyramids, adds Dr. Buckland, and the celebrated Sphinx, are composed of limestone loaded with these Nummulites.[*]

Dinotherium.

It is impossible, says the same distinguished geologist, to see such mountain masses of the remains of a single family of shells thus added to the solid materials of the globe, without recollecting that each individual shell once held an important place in the body of a living animal. And thus may we carry back our imagination to those remote and dim mysterious ages when the ocean waters, which then overflowed the European continent, teemed with swarms of these extinct molluscs, thick as the countless myriads of Beröe and Clio Borealis now living their little life in the polar seas.

Like the Nautilus and Ammonite, the Nummulites were enabled to float by means of the air-chambers into which the shell was divided. The chambers were numerous, and minutely divided by transverse partitions; they had no siphuncle. In form the shells were orbicular, convolute, without any trace of spire externally, and composed of contiguous whorls. Scarcely any of them exceed an inch in diameter.

We now pass on to the second, or Miocene system of Tertiary deposits, containing an admixture of the extinct genera of lacustrine mammals, with the earliest forms of existing genera. Thus, in the marine formations of Touraine, the fossil remains of Lophiodon, Anoplotherium, and Palæotherium have been discovered mingled with bones of the tapir, mastodon, horse, hippopotamus, and rhinoceros.[*] We shall see, however, that new genera now first made their appearance on the earth, and that the Eocene mammals rapidly became extinct. "One or two of the generic forms," says Professor Owen, "most frequent in the older tertiary strata still lingered on the earth, but the rest of the Eocene Mammalia were superseded by new forms, some of them presenting characters intermediate between those of Eocene and those of Pliocene strata.

Among the Miocene types of life we give the foremost place to the *Dinotherium*, as the largest of terrestrial mammalia. It holds an intermediate place between the tapir and the mastodon, and thus supplies another valuable extinct link in the great pachydermatous family.

The largest species of this genus, *Dinotherium giganteum*, is calculated by Cuvier to have attained the extraordinary length of eighteen feet. A skull disinterred at Epplesheim, in Hesse Darmstadt, in 1836, measured four feet long by three feet broad.

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[*] Of the species *Nummulina discoidalis.*

[*] Near Darmstadt, in Miocene strata, were found the following remains:—

	Species.	
Dinotherium, . . .	2	Gigantic herbivorous animals, fifteen and eighteen feet in length.
Tapirus, ...	2	Larger than any living species.
Chalicotherium, . .	2	Allied to the tapir.
Rhinoceros, . . .	2	
Tetracaulodon, . .	1	Allied to mastodon.
Hippotherium, . .	1	Allied to the horse.
Sus, ...	3	Hog.
Felis, ...	4	Large cats, some as big as a lion.
Machairodus, . . .	1	Allied to bear (*Ursus cultridens*).
Gulo (Glutton), . .	1	
Agnotherium, . . .	1	A canine genus, as large as a lion.

The most remarkable bone of the body yet found is the shoulder-blade, which, in form, more nearly resembles that of the mole than of any other animal, and seems to indicate a peculiar adaptation of the fore-leg to the purposes of digging—an indication confirmed by the singular structure of the lower jaw.

The form of the animal's molar teeth approximates to that of the molar teeth of the tapir; but a noticeable deviation from the character of the tapir, as well as of every other quadruped, consists in the presence of two enormous tusks, placed at the anterior extremity of the lower jaw, and curved downwards like the upper tusks of the walrus.

"It is mechanically impossible," says Dr. Buckland, "that a lower jaw, nearly four feet long, loaded with such heavy tusks at its extremity, could have been otherwise than cumbrous and inconvenient to a quadruped living on dry land. No such disadvantage could have attended this structure in a large animal destined to live in water; and the aquatic habits of the family of tapirs, to which the Dinotherium was most nearly allied, render it probable that, like them, it was an inhabitant of fresh-water lakes and rivers. To an animal of such habits, the weight of the tusks sustained in water would have been no source of inconvenience; and if we suppose them to have been employed as instruments for raking and grubbing up by the roots large aquatic vegetables from the bottom, they would, under such service, combine the mechanical powers of the pickaxe with those of the horse-harrow of modern husbandry. The weight of the head, placed above these downward tusks, would add to their efficiency for the service here supposed, as the power of the harrow is increased by being loaded with weights.

"The tusks of the Dinotherium may also have been applied with mechanical advantage to hook on the head of the animal to the bank, with the nostrils sustained above the water, so as to breathe securely during sleep, whilst the body remained floating at perfect ease beneath the surface; the animal might thus repose, moored to the margin of a lake or river, without the slightest muscular exertion, the weight of the head and body tending to fix and keep the tusks fast anchored in the substance of the bank; as the weight of the body of a sleeping bird keeps the claws clasped firmly around its perch. These tusks might have been further used, like those in the upper jaw of the walrus, to assist in dragging the body out of the water; and also as formidable instruments of defence.

"The structure of the scapula, already noticed, seems to show that the fore-leg was adapted to co-operate with the tusks and teeth in digging and separating large vegetables from the bottom. The great length attributed to the body would have been no way inconvenient to an animal living in the water, but attended with much mechanical disadvantage to so weighty a quadruped upon land. In all these characters of a gigantic, herbivorous, aquatic quadruped, we recognize adaptations to the lacustrine condition of the earth, during that portion of the tertiary periods to which the existence of these seemingly anomalous creatures appears to have been limited."

A genus of carnivorous Mammalia belonging to the Miocene period has been named the *Machairodus*, from *μαχαιρά*, "a sword," and *οδους*, a "tooth;" in allusion to its distinguishing characters, its long, curved, compressed teeth, the crowns of which have finely serrated margins. The fossil remains of this quadruped have been discovered in this country, and in several parts of Europe. In this island, says Professor Owen, anterior to the deposition of the drift, there was associated with the great extinct tiger, bear, and hyæna of the caves, in the destructive task of controlling the numbers of the richly developed order of the herbivorous Mammalia, a feline animal, the *Machairodus*, as large as the tiger, and, to judge by its instruments of destruction, of even greater ferocity. When we read that, in certain districts of India, whole villages have been depopulated by the destructive incursions of a single feline species, the tiger, we can scarcely conceive it possible that man, in an early and rude condition of society, could have resisted the attacks of the more formidable tiger, bear, and machairodus of the cave epoch. And this consideration may lead us the more readily to accept the negative evidence of the absence of any well-authenticated human fossil remains, and to conclude that man did not exist on the earth which was simultaneously ravaged by these formidable Carnivora, aided in their mission of destruction by herds of savage hyænas.

The fossiliferous deposits of the Siwalik hills in India, which were so thoroughly explored by Dr. Falconer and Major Cautley, and which include remains of a giraffe, an ostrich, three large Carnivora, and other animals, also belong to the sub-period we are now considering. Among these animals, one of the most interesting seems to have been the *Sivatherium*, so named from *Siva*, an Indian deity, and *θηριον*, "a wild beast." It resembled a gigantic antelope in the shape of its body, but its head must have borne some likeness to that of an elk: for it was short and thick, with two pairs of horns; the front pair small, the hind pair much larger, and probably palmated and set behind. The eyes were small, and placed on either side of the head.

Huge must have been the lips in proportion to its other physiognomical features; and from the large projecting bone over the nasal aperture, it is evident that this strange creature was furnished with a proboscis, an organ not found in any existing species of the *Ruminantia*, and which it availed itself of, we may infer, to bring within its reach the young shoots and boughs of the loftier trees.

In bulk the skull was scarcely inferior to that of an elephant; the neck was shorter than in the giraffe, much stronger, and admirably adapted to sustain the weight of the heavy head and its two pairs of massive horns.

There seems to have been two species of this extraordinary genus. The larger is called by Dr. Falconer *Sivatherium giganteum;* the smaller, *Sivatherium Perimense.*

We only notice further the *Galecynus*, the genus of fossil carnivorous Mammalia, also belonging to the middle Tertiaries, and founded for the reception of a singular fossil, discovered in a quarry at Œningen. When first obtained, and presented to the British

Museum, it was invested with a hard calcareous incrustation; so that a rude imperfect outline was only visible. This crust was carefully and skilfully removed by Dr. Mantell, whose labours developed the skeleton of an extinct fox-like animal; differing from the existing fox in the greater robustness of its limbs, and the elongation of its feet. Its habits and general characteristics, however, wonld seem to have been identical.

The seas at this period were inhabited by numerous marine Mammalia, such as whales, dolphins, seals, walruses, and the lamantins, manati, or sea-cows, whose existing species are chiefly found near the coasts and estuaries of the torrid zone. The presence of the lamantin may be accepted as an additional argument to that suggested by the tropical character of many other animals, even of the latest Tertiary strata, in favour of the opinion, that the climate of Europe maintained a high, though probably a gradually decreasing temperature, even to the latest period of the Tertiary formations.

The accompanying illustration (Plate 8) presents us with an ideal landscape of the Miocene period; but before we can fully realize it in all its details, we must glance at the conditions of vegetable life which then prevailed.

The lover of Shelley will remember, in "Alastor," the poet's fine description of a tropical forest:—

> "One vast mass
> Of mingling shade, whose brown magnificence
> A narrow vale embosoms. . . .
> "More dark
> And dark the shades accumulate; the oak,
> Expanding its immense and knotty arms,
> Embraces the light beech. The pyramids
> Of the tall cedar, overarching, frame
> Most solemn domes within; and far below,
> Like clouds suspended in an emerald sky,
> The ash and the acacia floating hang,
> Tremulous and pale, like restless serpents, clothed
> In rainbow and in fire. The parasites,
> Starr'd with ten thousand blossoms, flow around
> The grey trunks; and, as gamesome infants' eyes,
> With gentle meanings and most innocent wiles,
> Fold their beams round the hearts of those that love,
> These twine their tendrils with the wedded boughs
> Uniting their close union; the woven leaves
> Make network of the dark blue light of day,
> And the night's noontide clearness, mutable
> As shapes in the weird clouds."

Allowing for the different types of vegetation, we can recognize that the scene painted so eloquently by the poet was everywhere visible in the luxuriant woodlands of the Miocene world. The vegetation which then prevailed was such as one might expect to meet in a poet's dream of Arcadian fairyland, a mixture of the plants which nowadays flourish only under "hot Afric's sky," such as palms, and bamboos, and Terminalia, the grand Leguminosæ of warm climates (as Phaseolites, Erythrina, Bauhinia, Mimosites, Acacia), Apocyneæ analogous to the genera of our tropical regions, and a Rubiacea altogether tropical, with the genera now confined to temperate and even inclement regions, as maples, walnut trees, beeches, elms, oaks, and wych elms.

During the Miocene period also flourished mosses and mushrooms, evergreens, charas, fig trees, planes, and poplars.

At this epoch of the world's history the algæ and marine monocotyledons were less abundant than in a preceding age; the ferns and the conifers declined in numbers, and the palms multiplied in species. Some of those cited before seem still to belong to this period; and the magnificent *Flabellaria*, with the noble *Phœnicites*, which now appears for the first time, gave animation to the landscape. Among the conifers, we recognize some new genera; especially *Podocarpens*, a southern form of vegetation of the present age. Almost all the arborescent families have their representatives in the Miocene forests, where for the first time the widely different types are united. The waters are covered with aquatic plants, *Nymphæa Arithnaæ*, and *Myriophyllites capillifolius;* Culmites of various species profusely adorn their banks; and the great *Bambusinites sepultana* flings across the rippling wave the slender shadow of its long articulated stem. Some analogous species occupy the margin of the great rivers of the New World.

Arborescent vegetation seems at this epoch to have attained its highest development. Numerous Smilacites interlaced, like the wild vines, the trunks of the grand forest trees, which fell on the ground, decayed and rotten, where they had previously thriven and waxed strong. These rich scenes of abundant vegetable growth, of parasites and epiphytous plants and creepers, are familiar to travellers in tropical regions, where nature often wears her gayest livery under a curtain of clouds which the sun is unable to penetrate.

"I have reached a zone," says D'Orbigny, speaking of Rio Chapura, in South America, "where it rains regularly all the year round. We can scarcely perceive the rays of the sun at intervals through the cloudy screen which almost constantly veils it. This circumstance, added to the heat, gives an extraordinary development to the vegetation. The wild vines droop on all sides in wreaths and festoons from the topmost branches of trees whose summits are lost in the clouds."

Thus then, we find tropical plants associated with the vegetables of temperate climates, though they are not yet the same as existing species. Oaks grow side by side with palms, the birch in strange companionship with the bamboo, the laurel vies with the stately elm, and the maples mingle with the Combretaceæ, the Leguminosæ, and the tropical Rubiaceæ. The forms of the species belonging to temperate regions are, however, rather American in character than European.

Professor Heer, a German botanist, has identified three thousand species as belonging to the Miocene period. Among these European plants occupy a secondary rank, while an important position is held by the evergreen oaks, maples, poplars, and plane trees, Robinias and Taxodiums of America.

The reader will now appreciate our ideal landscape of the Miocene period, which in luxuriance resembles a tropical, and in character a temperate region. In many respects the vegetation reminds us of that of the Carboniferous period. It is, in truth, a continuation of the characteristics of that period, and from the same cause, namely, the submersion of land under marshy waters, which has originated a sort of coal, often found in the Miocene formation, and known as *lignite*. This imperfect coal differs from that of the Carboniferous, or true coal-measure period, because it is of too recent date, and because it has not undergone the same pressure of superincumbent beds and the same force of internal heat.

The animals represented in our landscape are—the dinotherium, basking in the rank, marshy grass; the gigantic mastodon; the rhinoceros; and an ape of great stature, the *Dryopithecus*, swinging from the branches of a tree. The river winds far away through the leafy valley, almost arrested in its course, and broken up into still lakelets and sleepy ponds, by dams and weirs of aquatic plants; and against the horizon towers the huge bulk of a lofty mountain range. The earth is losing its air of mystery and strangeness, and the landscapes are gradually assuming a familiar character. On every hand we see the signs of a coming change which shall fit the earth for its lord and master—Man!

The next sub-period, belonging to the upper Tertiaries, has been named by Sir Charles Lyell

THE PLEIOCENE,

or "more recent," because the organic remains treasured up within its strata number between sixty and seventy per cent. of living species; that is, more than we find in the older Miocene, and less than we find in the next and last sub-period, the Pleistocene.

In Great Britain the Pleiocene strata are only found in Suffolk, where they are superimposed on the upper beds of the London clay. Locally, they are known as "crag." Consisting of shelly sand, they have been advantageously employed in manuring soils which are deficient in calcareous matter, and they are subdivided into the red crag and the coralline crag, each with an average depth or thickness of fifty feet.

The former consists of beds of quartzose sands and gravel, mixed with shells, generally rolled and comminuted into sand, the whole of an ochreous or deep ferruginous colour. The fossils are chiefly molluscous, but the bones and teeth of skates, sharks, and other fish, have been discovered, and the ear-bones of one or more true whales.

The coralline crag is generally calcareous and marly, and composed of numerous shells and Polyzoa, separated in many places by thin strata of hard limestone, and coralline masses in the position in which they formerly lived. It is white in colour, and would seem to have been deposited in deeper and less disturbed water than the red crag. From the character of its fossils it may be inferred that the temperature of the ocean was still high. The calcareous Polyzoa are abundant and beautiful.

About three hundred and forty-five species of Testacea have been procured from the coralline, and two hundred and thirty from the red crag, of which about one hundred and fifty are common to both. About seventy per cent. of the newer division, and about sixty per cent. of the older, are also recent.

The terrestrial animals of the Pleiocene period include several species remarkable from their proportions and from their structure. Both the mammals and the batrachian reptiles are worthy of our attention.

Among the former we refer, in the first place, to the *Mastodon*, which would seem to have very nearly resembled our present elephant, both in size and form, except that the body was somewhat longer and the legs a little thicker. He had tusks, and probably a trunk, but was characterized by the peculiar structure of his molar teeth. These are nearly rectangular, and in their upper surface exhibit a number of great conical tuberosities, with rounded points disposed in pairs to the number of four or five, according to the species. Their form, says Figuier, is very distinct, and may easily be recognized. They bear no resemblance to those of the Carnivora, but are like those of herbivorous animals, and particularly those of the hippopotamus. The molar teeth are at first sharp and polished, but the conical points are worn down by the constant process of mastication.

The *Mastodon* first attracted the attention of European men of science towards the middle of the last century. Some bones had been previously discovered at Albany, in the United States, but without receiving much consideration. In 1739 M. de Longueil, while exploring the immense forests on the river Ohio, in order to reach the Mississippi, came upon a deposit of bones, some of which, on his return to France, he presented to the great naturalists, Daubenton and Buffon: they consisted of a gigantic femur, one extremity of a tusk, and three molar teeth. Buffon, after a careful examination of them, declared them to be the bones of a primeval quadruped, from six to eight times the size of our existing elephant. He named it the Animal or Elephant of the Ohio.

In 1801 were first discovered the remains of the perfect skeleton; and at a later period it was ascertained, from the exhumation of a mass of vegetable matter in the stomach of the animal, that its habits were unquestionably herbivorous.

The North American Indians called the *Mastodon* "the father of the ox." In one of their most popular traditional songs occurs the following passage: "When the great Manitou descended to the earth in order to assure himself of the happiness of the beings he had created, he questioned all the animals upon their wants and desires. The bison, in his turn, replied that he should be quite contented with his lot in the grassy pastures, where the rich herbage reached his belly, if he were not compelled to keep his eyes constantly turned towards the mountains to descry the approach of the Father of oxen, as he descended with fury to devour him and his companions."

Among the Chavanais Indians a tradition lingered that these huge animals lived long ages ago, contemporaneously with a race of gigantic men, and that both were destroyed by the Great Being with his annihilating thunders. The native Indians of Virginia had a somewhat similar legend. As these huge elephants preyed upon all the other animals created to supply the wants of the Indians, God the Thunderer destroyed them, only one succeeding in escaping the terrible bolts. This was the "great male, which presented its head to the thunderbolts, and shook them off as they fell; but being at length wounded in the side, he fled towards the great lakes, where he remains concealed unto this day."

From these simple fictions we may, at all events, infer that the *Mastodon* has flourished upon earth at no very remote epoch. In truth, it was contemporaneous with the mammoth, and the latter, if he did not live at the same time as the earliest human races, preceded them but by a very brief interval.

It was Cuvier who distinguished the great quadruped from the living elephant by pointing out its osteological differences, and appropriately named it the *Mastodon*, or teat-like toothed animal, from the Greek *μαστος*, "a teat," and *ὀδους*, "a tooth."

Mastodon restored.

As we have said, its habits were herbivorous. It doubtlessly lived on the banks of great rivers and on moist and marshy lands. Besides the *Mastodon giganteus* there flourished a less formidable species, one-third smaller than the elephant, which ranged over nearly all Europe.

At this period (and also in the Miocene) the Apes make their appearance. In the ossiferous beds of Sausun were discovered the Pithecus antiquus, and the Dryopithecus. At Pikerni, in Greece, have been found the entire skeleton of a Mesopithecus, whose general organization resembled that of the dog-faced baboon, or mandrill.

The hippopotamus, tapir, and camel of the Pleiocene period were not distinguished by any remarkable characters. The horse, the ox, and the deer resembled their successors of the same genera in all important features; the horse, however, did not exceed in size the ass of the present epoch.

The species of rhinoceros belonging to the upper Tertiaries is the *Rhinoceros tichorhinus*, the Latin adjective referring to the peculiar bony partition which separated its two nostrils. Its nose was surmounted with two horns; its huge body clothed with very thick hair; while its skin lacked the rough callous scales which are found on that of the living African species.

The traveller Pallas furnishes a very interesting account of a *Rhinoceros tichorhinus* which he saw exhumed from the ice, wherein its skin, hair, and flesh had been preserved. This occurred on the banks of the Viloui, a Siberian tributary of the Lena, in December, 1771.

"The remains appeared to me at first glance," he said, "to belong to a rhinoceros; the head especially was quite recognizable, since it was covered with its leathery skin, and the skin had preserved all its external characters, and many short hairs. The eyelids had even escaped total decay, and in the cranium here and there, under the skin, I perceived some matter which was evidently the remains of putrified flesh. I also remarked in the feet the remains of the tendons and cartilages where the skin had been removed. The head was without its horn, and the feet were without hoofs. The place of the horn, and the raised skin which had surrounded it, and the division which existed in both the hind and fore feet, were evident proofs of its being a rhinoceros. . . The skin and tendons of the head and feet still preserved considerable flexibility, imbued as it were with moisture from the ground; but the flesh exhaled a strong ammoniacal odour.

"The rhinoceros to which the different members belonged was neither large for its species nor advanced in age, as the bones of the head attested; yet it was evidently an adult, from a comparison made of the size of the cranium with that of others of the same species more advanced in age, which were afterwards discovered in a fossilized condition in divers parts of Siberia. The entire length of the head, from the upper part of the nape of the neck to the extremity of the denuded bone of the jaw, was thirty inches; the horns were not with the head, but we could still see evident traces of two, the nasal and frontal. The front, unequal and a little protuberant between the orbits, as well as of a rhomboidal shape, was deficient in the skin, and only covered by a light horny membrane, bristling with hard straight hairs. The skin which clothed the greater portion of the surface of the head was, in the dried state, a tenacious fibrous substance, like curried leather, of a brownish black on the outside and white in the inside—when burnt, its odour was that of common leather; the mouth, in the place where the lips should have been soft and fleshy, was putrid and greatly lacerated; the extremities of the maxillary bone were bare.

"On the left side, which probably had been longest exposed to atmospheric action, the skin in some places was decomposed and rubbed on the surface. Yet, on the right side, most of the mouth was so well preserved that the pores or little holes, from which doubtless the hairs had fallen, were still visible all over that side, and even in front. In certain places on the right side of the jaw numerous hairs were still grouped in tufts;

most of them were rubbed down to the roots, but a few still retained their full length. They stood erect, are stiff, and of an ashen colour, but in each bunch were two or three quite black, and more rigid than the others.

"The most surprising fact, however, was that the skin which covered the orbits of the eyes, and formed the eyelids, was so well preserved and so healthy that the openings of the eyelids could be seen, though deformed and scarcely penetrable to the finger; the skin which surrounded the orbits, though desiccated, formed circular furrows. The cavities of the eyes were filled with matter, either argillaceous or animal, such as still partially filled the cranium. Under the skin the fibres and tendons still remained, and, above all, the remains of the temporal muscles; finally, in the throat hung some great bundles of muscular fibres. The denuded bones were young, and not so solid as in other fossil crania of the same species. The extremities of the jaws preserved no trace either of teeth or sockets, but were covered here and there with the remains of the integument. The first molar was distant about four inches from the exterior edge of the jaw."

Contemporaneous with these large mammals were great numbers of reptiles, of which the most remarkable was the *Salamander*. The Salamanders of the present epoch are amphibious Batrachians, with smooth skins, and rarely attain the length of twenty inches; but the Salamander of the upper tertiaries was as large as a crocodile. When first discovered, and for some time afterwards, until Cuvier and Camper showed its true character, it was supposed to be a human victim of the Deluge, and christened, "homo diluvii testis."

"It is certain," wrote the learned Scheuchzer, in his "Physica Sacra," "that this schist"—he referred to the schistose limestone quarries of Œningen, in Switzerland —"contains the half, or nearly the half, of the skeleton of a man; that the substance even of the bones, and what is more, of the flesh and of parts still softer than the flesh, are there incorporated in the stone; in a word, it is one of the rarest relics which we have of that accursed race which was buried under the waters. The figure shows us the contour of the frontal bone, the orbits with the openings which give passage to the great nerves of the fifth pair. We see there the remains of the brain, of the sphenoidal bone, of the roots of the nose, a notable fragment of the maxillary bone, and some vestiges of the liver." And our enthusiastic author exclaims, in bad rhyme and rhythm—

"Betrübtes Beingerüst von einem altem Sunder
Erweiche, Stein, das Herz der neuen Bosheitskinder!"

which has been thus Englished:—

"Oh deplorable skeleton of an accursed ancient,
May the sinner on beholding thee repent!"

An examination of any engraving of this ancient animal will show the reader how utterly fanciful was the resemblance which Scheuchzer's heated brain professed to discover between the Pleiocene fossil and the human skeleton. Cuvier convincingly exposed the absurd error, and restored the primeval animal to its proper place in creation, as an amphibious Batrachian of the order *Salamander*.

Birds were also very numerous during the Pleiocene period, cheering the solitudes with their songs, and enlivening them with their brilliant plumage. Among the most conspicuous genera were eagles, vultures, gulls, swallows, pies, parroquets, jungle-fowl, ducks, and pheasants.

We have now arrived at the last period of the primeval world, and we find the characters of its vegetation and the general features of its landscapes, as may be seen in our illustration (Plate 9), more and more closely approximating to those which now obtain. Vast physical changes have taken place in the physical relations of the globe, corresponding to the mutations we have described as being effected in the organization and disposition of animal life. The dinornis and palæpteryx, the megathere, the toxodon, and the mylodon, the camel, the giraffe, the rhinoceros—these animals could not have existed on the earth of the Cretaceous or Oolitic ages; our planet had to be fitted for their reception, preparatory to the appearance of humanity on the wondrous theatre designed by Almighty Power. In the northern hemisphere, therefore, a cooler temperature prevailed; many of the principal mountain-chains, the Himalayas, the Alps, the Apennines, having been elevated into their present position, and the large inland seas which had occupied the central plains of Europe, Asia and Africa, having gradually been transformed into lake, swamp, and dry land.

In the Pleiocene period, therefore, though the temperate zones are still adorned by tropical forms of vegetation, we find them slowly declining before the influences of a colder climate and the encroachments of hardier species. We find everywhere the signs of great terrestrial commotions; the continents now assume their final configuration; the great rivers are confined within well-marked channels; and lofty mountain peaks, crowned with eternal snow, tower far above the clouds.

Two hundred and twelve species, we are told, compose the rich Pleiocene flora. The huge ferny growth of the earlier ages is scarcely indicated; many of the varieties of Palmaceæ have wholly passed away; and the forms generally prevailing are absolutely identical with the species which now embellish our forests, meadows, and smiling valleys. The *Culmites arundinaceus* abounds near the water's edge, where also flourishes the *Cyperites tertiarius;* on the surface of the stream floats the *Dotamogeton*, and beneath it waves the *Isoetes Braunii*. Stately conifers still compose the dense, shadowy, pathless forests. This noble family has passed, as we have seen, through every epoch, every chance and change of the history of the primeval world, and still enriches the landscape with its graceful forms and evergreen foliage; *Taxodites*, *Thuyoxylum*, *Abietites*, *Eleoxylon*, *Taxites*, and *Pinites*, being still the most abundant forms in our natural forests.

"The predominating character of this period," says Lewy, "is the prevalence of the group of the Amentaceæ. While the Conifers are only thirty-two in number, we reckon of the other two and fifty species, and among these many European genera, such as *Alnus; Quercus*, the oak; *Salix*, the willow; *Fagus*, the beech; *Betula*, the birch.

"The following families constitute the arborescent flora of the period, in addition to those already mentioned:—

Amygdaleæ.
Aceraceæ.
Anacardiaceæ.
Balsaminaceæ.
Calycanthaceæ.
Capparidaceæ.
Celastrinaceæ.
Ericaceæ.
Juglandaceæ.
Leguminosæ.
Lauraceæ.
Magnoliaceæ.
Meliaceæ.
Myrtaceæ.
Oleaceæ.
Pinnaceæ.
Rosaceæ.
Santalaceæ.
Sapindaceæ.
Sapoteaceæ.
Styracaceæ.
Tiliaceæ.

"In all these families great numbers of European genera are found, even more subdivided into species than is now the case. Thus, as Brongniart observes, we reckon in this flora fourteen species of maple; three species of oak; and these species are found in two or three very circumscribed localities, that, at the present time, would probably not represent, in a radius of several leagues, more than three or four species of these genera."

Such is the character of the vegetation which the artist has represented in his ideal landscape. In the background he shows us a mountain of recent elevation, to remind us that the epoch was one of frequent convulsions, that the soil was subjected to violent changes, and mountains and mountain ranges then rose above the waters. In the foreground a rhinoceros rises from the marshes of the river-bank; an elephant calmly surveys the scene before him; a horse gallops in unrestrained liberty over the grassy plain; and thirsty cattle come down to the stream for refreshment and repose.

We now arrrive at the

POST-PLEIOCENE PERIOD,

also called the Pleistocene, and sometimes described as the introductory age of the Quaternary, or, as Sir Charles Lyell would call it, the Post-tertiary epoch.

The earth in those remote days presented a strange but animated aspect, which a writer already quoted has described in graphic terms.

The reader, with the help of fancy, may discern a panorama of shallow seas swarming with humble forms of animal life; islands covered with bushy palms; banks on which turtles basked in the sand; vast basins of fresh or brackish water, in which the tide made itself felt, and which abounded with various species of sharks; rivers in which crocodiles increased and multiplied; woods which sheltered numerous mammals and some serpents of large size; fresh-water lakes which received the spoils of numerous shells. Dry land has increased immensely. Groups of ancient isles have united into continents, with lakes, bays, and perhaps inland seas. Gigantic elephants, considerably larger than any now existing, terminate the epoch, and probably usher in the succeeding one; for the reader must not suppose, as we have already hinted, that any absolute barrier existed between one period and another, or any broad and unmistakable line of demarcation. But, judging from their remains, these primeval elephants must have existed in great numbers. It is said that on the coast of Norfolk alone, the fishermen, in trawling for oysters, fished up in thirteen years no less than two thousand molar teeth of elephants. Considering the slow increase of these animals, such "quarries of ivory," as Figuier calls them, must have required many centuries for their production.

The lakes and rivers were at the same time infested by the hippopotamus, not less colossal or less formidably armed than the species now inhabiting the African solitudes; and in the marshes and the marshy plains roamed the two-horned rhinoceros, and three species of Bos (or ox), one of which was hairy and bore a mane. Deer of gigantic size—compared with living species—bounded across the broad savannahs. There, too, the reindeer, the goat, the horse, the ass, the bear, and the roe, enjoyed the delights of unlimited freedom. In the rank jungles lurked the tiger, as large as any feline species now existing. Another animal of the same race, the Machairodus, was probably the most ferocious and destructive of Carnivora. A terrible bear, surpassing in size that of the Rocky Mountains, and bands of wild hyænas, established themselves in the caverns; two species of beavers, and one of apes, now first appeared in the lists of created life.

Geology records few more interesting incidents than the discovery of ossiferous deposits of the most varied character at Kent's Hole, near Torquay, and in the Kirkdale Cave of Yorkshire. The occurrence in these deposits of the bones of animals not generally found together, has been the cause of much speculation. Dr. Buckland was of opinion that one of the last great physical events affecting the surface of our globe was a violent inundation which overwhelmed great part of the northern hemisphere, and that this event was followed by the sudden disappearance of a large number of the species of terrestrial quadrupeds which had inhabited those regions in the period immediately preceding it. Recent geologists, however, trace their extinction to the slow and successive action of local causes, and especially to a gradual decline of the temperature.

The more interesting of these Post-pleiocene extinct animals we shall describe. To our hemisphere there belonged the mammoth (*Elephas primigenius*); the bear (*Ursus spelæus*); the gigantic tiger (*Felis spelæa*); the hyæna (*Hyæna spelæa*); the ox (*Bos priscus*, and *Bos primigenius*); the gigantic stag (*Cervus megaceros*); and the *Dinornis* and *Epiornis* among birds.

In America, during this period, existed some colossal Edentates of remarkable structure:—The *Megatherium;* the *Megalonyx;* the *Mylodon.*

The *Mammoth* exceeded in dimensions the largest of existing elephants, for it measured from sixteen to eighteen feet in height, and it was distinguished from living species by the semicircular curvature of its monstrous tusks, which were from twelve to thirteen feet long. From its ally, the Mastodon, it was distinguished by its teeth; for while those of the latter were covered with rough tubercles, the mammoth's had a broad uniform surface, regularly marked with furrows of large curvature. Its teeth were four in number; two in each jaw, when the animal was adult; its head was elongated, its forehead concave, its jaws curved and truncated in front. The whole of its huge bulk was clothed with long shaggy hair, and along its robust neck and back waved a thick heavy mane. Its trunk resembled that of the Indian elephant; its body was cumbrous; its legs shorter than those of the latter animal, with which in habits, however, it closely corresponded.

The fossil bones of the Mammoth have been frequently discovered, and in almost all parts of Europe; as, for instance, in Scandinavia, in Ireland, in Germany, in Central Europe, in Poland, in Central and Southern Russia, in Greece, Spain, Italy, and England. They have also been found in Asia, Africa, and the New World. But they occur in the greatest abundance in the regions of northern Europe, where no modern elephant could possibly exist. "There is not," says Pallas, "in the whole of Asiatic Russia, from the Don to the extremity of the Tchertchian promontory, any brook or river, especially of those which flow in the plains, on whose banks some bones of elephants and other animals foreign to the climate have not been found. But in the more elevated regions, the primitive and schistose chains, they are wanting, as are marine petrifactions. In the lower slopes, and in the great muddy and sandy plains, above all in places which are swept by rivers and brooks, they are always met with, which proves that we should assuredly find them throughout the whole extent of the country, if we had the same means of searching for them."

Mammoth restored.

Connected with the discovery of these remains some extraordinary but well authenticated stories are related:—In 1799 a Tungusian fisherman observed among the icebergs, on the shore of the Frozen Sea, near the mouth of the river Lena, a strangely-shaped block which he could not understand. The following year he perceived that this block was further detached from the surrounding mass of ice, but was still unable to divine its character. Towards the close of the third year one whole side was exposed to view, and he then discovered the entire flank and tusks of the Mammoth protruding from the ice. It was not till the fifth year that, under the influence of a remarkably genial spring, the enormous mass became stranded on a sand-bank of the coast. In the month of March, 1805, the fisherman removed the tusks.

Two years after this Mr. Adams, of the St. Petersburg Academy, travelling in the suite of Count Golovkin, whom the czar of Russia had despatched on an embassy to China, obtained information of these curious incidents, and hastened to examine the locality. He found the animal considerably mutilated. The Yakoutskes had cut off the flesh, so wonderfully preserved for thousands of years, to feed their dogs, and it had also been mangled by wild beasts. Nevertheless, the skeleton remained nearly intact, with the exception of one forefoot. The spine of the back, a scapula, the pelvis, and the remains of the three limbs, were still connected by the ligaments and a portion of the skin; the missing scapula was found in the immediate neighbourhood. A dry skin covered the head; one of the ears, well preserved, was furnished with a tuft of hair; you might still distinguish the balls of the eyes; the brain, but dried up, still occupied its place in the cranium; the under lip had been rubbed, and the upper lip destroyed so as to expose the jaws; a flowing mane adorned the top of the neck; the skin was covered with tufts of black hair and reddish wool. The remains of the animal were so bulky that it was with difficulty ten persons carried them. Upwards of thirty pounds weight of hair and wool was recovered which the white bears had plundered, and, devouring the flesh, had buried in the moist soil. The animal was a male; its tusks exceeded nine feet in length, and the head, without the tusks, weighed upwards of four hundredweight.

Figuier remarks that it is very strange that the East Indies, one of the only two regions now inhabited by the elephant, should be the sole country where the fossil bones of the Mammoth have not been discovered. It is evident, from the data gathered by geologists, that during the Post-tertiary epoch this colossal quadruped inhabited every country of the globe. But the only climates now suitable to the race of elephants are those of Africa and India, in other words, tropical climates: hence we must infer that at the epoch of the Mammoth and the Mastodon, the temperature of the earth was considerably higher than now obtains, or else that these extinct animals were adapted for inhabiting a colder region than their successors can now endure.

One of the most formidable of the antediluvian Carnivora seems to have been the *Ursus spelæus*, or Cave Bear.

This species was probably a fourth larger than the existing brown bear, and was also of a more cumbrous and ungainly shape. The skeletons found average nine or ten feet in length, and not above six feet in height. The Cave Bear abounded in England, Belgium, Vienna, and Germany.

The *Felis spelæus*, or Cave Tiger, was twice the size of its modern successor, and, in fact, partook of the characters of both tiger and lion. Its body exceeded in bulk and strength that of the largest bull, while measuring upwards of four yards in length.

The *Hyæna spelæa*, or Cave Hyæna, closely resembles, not only in size, but in habits, the existing spotted hyæna of the East. The fossil remains of about three hundred individuals were discovered in the Kirkdale cave, together with the bones of the animals they had devoured.

The *Horse* dates from the Quaternary epoch, says Figuier, if not from the last period of the Tertiary epoch. Its remains are found in the same rocks with those of the Mammoth and the Rhinoceros. It is distinguished from our existing horse only by its size, which was smaller: its memorials abound in the Post-pleiocene strata, not only in Europe but in America; so that an aboriginal horse existed in the New World long before it was carried thither by the Spaniards, although it was unknown at the date of their arrival.

The Post-pleiocene oxen very nearly approximated to present species. Three varieties have been recognized: the *Bos priscus*, *Bos primigenius*, and *Bos Pallasii*. The first had slender legs; its broad forehead was high and convex, and except that it was taller, and had larger legs, it differed but little from the Aurochs. Our domestic oxen, according to Cuvier, spring from the *Bos primigenius*. The *Bos Pallasii*, found in America and Siberia, resembled, in many important respects, the Canadian Musk-ox.

Of the Deer it may safely be affirmed, that it is very difficult to distinguish the fossil remains from those of existing species. The only exception is in the case of the gigantic forest stag, *Cervus megaceros*, frequently called the "Irish Elk." Its remains are frequently found in Ireland, and more rarely in Germany, Poland, Italy, and France. Intermediate between the stag and the elk, the *Cervus megaceros* approached the latter in the shape of its cranium and its general proportions; the former in its size, and the arrangement of its horns. These were between nine and ten feet long, and so divergent that the space from one extremity to the other measured ten to twelve feet.

Its skeleton is exhumed from the deposits of calcareous tufa which underlie the immense peat moss of Ireland, and nearly always in the same attitude, as if suddenly overtaken by the crash of doom: its head is raised aloft, its neck stretched out, its horns reversed and sloped downwards towards the back, as if the animal, sinking all unexpectedly in marshy ground, had lifted itself in a vain attempt to drink in the respirable air.

We come now to the most curious and wonderful creatures of the Quaternary period, the colossal Edentates, by which it was peculiary distinguished—the gigantic Megatherium, the Glyptodon, the Mylodon, and the Megalonyx.

The prominent characteristic of the Edentates* is the absence of teeth in the fore part of the mouth. Their masticatory apparatus is confined only to molars, the canines and incisors being, with a few exceptions, altogether absent. Consequently the animals of this order feed principally upon insects, or on fruits, grass, and the young leaves of plants. The Armadillo, Ant-eater, and Pangolin are living examples of the order, which, as its members are further characterized by possessing largely-developed claws at the extremities of the toes, may be considered a connecting link between the hoofed mammals and the ungulated animals, or those armed with claws.

Among the Edentata of the Post-pleiocene period the foremost place must unquestionably be given to the *Megatherium*, an animal of the most extraordinary and fantastic character, nearly allied to the Sloth in some parts of its organization, and, like the Sloth, exhibiting an apparently monstrous and anomalous external form, accompanied internally by many peculiarities of conformation.

It has been a common error to depict the Sloth as one of the most imperfectly constructed of all the members of the animal kingdom, doomed to a life of misery, and utterly incapable of enjoyment. But the seemingly anomalous conditions on which the earlier naturalists so unwisely insisted are not only not deficiencies, or sources of pain or discomfort to the animal, but, on the contrary, are striking illustrations of the varied contrivances by which the great Maker adapts each of his creatures to the work it is intended to execute, and the particular circumstances under which it is designed to live.

"The peculiarities of the Sloth," says Dr. Buckland, "that render its movements so awkward on the earth, are fitted with much advantage to its destined office of living entirely upon trees, and feeding upon their leaves; so also, if we consider the Megatherium with a view to its province of digging and feeding upon roots, we shall, in this habit, discover the explanation of its unusual structure and apparently incongruous proportions, and find in every organ a relation of obvious convenience, and of adaptation to the office it had to discharge.

"At first sight this gigantic quadruped appears not only ill-proportioned as a whole, but endowed with the clumsiest and most incongruous members. Here we have a truly colossal animal, exceeding the largest rhinoceros in bulk, and to which the living species most closely approximative are the Sloth, the Armadillo, and the Chlamyphorus; the former adapted to an arboreal life; the two latter constructed to burrow in the sand in quest of food and shelter; and all limited in their geographical distribution nearly to the same regions of America that were once the habitat of the Megatherium.

"But let us examine with some degree of attention the more important organs of this seemingly monstrous creature, and we shall see how admirably they are fitted for the peculiar work they were called upon to perform. The bones of the head most nearly resemble those of a Sloth. The long broad bone descending to the cheek from the zygomatic arch, however, is a peculiarity connecting the Megatherium with the Ai; this extraordinary bone assisted a powerful set of muscles in giving motion to the lower jaw. The anterior part of the muzzle," according to Dr. Buckland, of whose admirable description we are largely availing ourselves, "is so strong and substantial, and so perforated with holes for the passage of nerves and vessels, that we may be assured it supported some organ of considerable size. As a long trunk was not needed by an animal with so long a neck, this organ was probably a snout, something like that of the tapir, of sufficient length to gather up roots from the ground. The partition of the nostrils being also strong and bony, furnishes an additional argument for the presence of a powerful organ appended to the nose; an apparatus which would have sufficiently compensated for the absence of incisor teeth and tusks. Having no incisors, the Megatherium could not have lived upon grass, while the structure of its molar teeth proves that it was not carnivorous.

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* From the Latin *e*, without, and *dens*, a tooth.

Megatherium restored.

"The composition of a single molar tooth resembles that of one of the many denticules that are united in the compound molar of the elephant; and affords an excellent exemplification of the method employed by Nature, whereby three substances of unequal density, viz., *ivory*, *enamel*, and *crusta petrosa*, or *cæmentum*, are united in the construction of the teeth of graminivorous animals The teeth are about seven inches long, and nearly of a prismatic form. The grinding surfaces exhibit a peculiar and beautiful contrivance for maintaining ten cutting, wedge-shaped, salient edges in good working condition during the whole existence of the tooth; being, as before stated, a modification of the contrivance employed in the molars of the elephant and other Herbivora. The same principle is applied by tool-makers for the purpose of maintaining a sharp edge in axes, scythes, bill-hooks. An axe, or bill-hook, is not made entirely of steel, but of one thin steel plate, inserted between two plates of softer iron, and so inclosed that the steel projects beyond the iron, along the entire line of the cutting edge of the instrument. A double advantage results from this contrivance; first, the instrument is less liable to fracture than if it were entirely made of the more brittle material of steel, and secondly, the cutting edge is more easily kept sharp by grinding down a portion of exterior soft iron, than if the entire mass were of hard steel. By a similar contrivance, two cutting edges are produced on the crown of the molar teeth of the Megatherium."

Thus the process of mastication formed and maintained in order a series of wedges, locking into each other like the alternate ridges on the rollers of a crushing-mill; and the mouth of the Megatherium was converted, in effect, into an engine of prodigious power, in which the grinding surfaces of sixteen molar teeth composed double that number of wedges; each tooth was from seven to nine inches long, and for the greater part of its length was firmly embedded in a very deep socket.

As the surfaces of these teeth would necessarily wear away with great rapidity, the loss incessantly occurring at the crown was constantly supplied by the addition of new matter at the root, which, for this purpose, remained hollow, and filled with pulp throughout the animal's life. Thus, this exquisite mechanical apparatus maintained itself in perfect order by the very act of performing its own work.

In proportion to the rest of the head the lower jaw is exceedingly large and weighty, having been so constructed for the purpose of affording deep sockets for the solid fixture and incessant growth of the long vertical molar teeth. And as it became necessary to provide a support for a jaw of this unusual bulk, the "process" descending from the so-called zygomatic arch in the Megatherium, as in all the sloths, is fashioned with unusual strength and rigidity.

The vertebræ of the neck, compared with those towards the opposite extremity of the body, are really small, but yet of sufficient size for the movements of a head which is of no excessive weight, and without tusks. The dorsal portion of the vertebral column is of moderate size, but the vertebræ of the loins enlarge, so as to correspond with the huge pelvis and colossal hind-legs. The summits of the spinous processes are flattened like those in the armadillo.

Dr. Buckland points out that the sacral bone is united to the pelvis in a very singular manner, evidently with the object of securing the greatest possible amount of strength, while its processes indicate that the muscles regulating the movement of the tail were of great power.

The tail was long, and composed of vertebræ of enormous magnitude; the body of the largest measuring not less than seven inches in diameter, while the distance horizontally between the extremities of the two transverse processes was twenty inches. Include the thickness of the muscles and tendons, and of the shelly integument, and you cannot estimate the diameter of the tail at its root at less than *two feet;* while its circumference, supposing it to be nearly circular, like the tail of the armadillo, would be about six feet, or twice the size of a well-grown man. These vast dimensions, observes our authority, are not larger, in proportion to the adjacent parts of the body, than those of the armadillo; and as this animal makes use of its tail as an auxiliary in supporting the weight of its body and armour, we may reasonably infer that the Megatherium employed its huge caudal extremity in a similar manner.* The large inferior spines, or additional chevron bones, attached to the caudal vertebræ, by increasing the strength of the tail, would render it more useful in this important rest. But the tail was also probably employed as a powerful defensive weapon, like that of the crocodiles and pangolins.

The ribs of the Megatherium are at once thicker, shorter, and more substantial than those of the rhinoceros or elephant; and in some of them the convex upper surfaces exhibit a rugose and flattened condition, showing the points where the weight of the bony cuirass chiefly rested.

The *scapula*, or shoulder-bone, is unlike that of any other family, except the Sloth, and displays in the *acromion* "contrivances for strength, peculiar to itself and them, in its mode of articulation with the collar-bone; it also exhibits unusual provisions for the support of the most powerful muscles for the movement of the arm."

The *clavicle*, or collar-bone, is strong, and incurvated nearly as in man. From the presence of this bone, which is wanting in the elephant, the rhinoceros, and all the large Ruminantia, we conclude that the fore-leg fulfilled some other function than that of a mere locomotive organ. This clavicle would afford a steady and permanent position to the socket, or glenoid cavity of the scapula, and so permit the animal's fore-leg, like the human arm, to move freely in a rotatory manner.

In these circumstances we find, says Dr. Buckland, whose admirable description of the Megatherium we have closely followed—1st, That a free rotatory power of the fore-leg was auxiliary to its office as an instrument to be continually employed in digging food out of the ground; 2nd, That this act of perpetual digging in search of stationary objects like roots, needed but little locomotive power; and 3rd, That the comparatively slight support rendered to the weight of the huge armour-plated body by the fore-leg, was abundantly compensated by the extraordinary, the almost gigantic strength, of the haunches and hind legs.

In the elephant the excessive weight of the animal's head, proboscis, and tusks require a short, thick neck, and a proportionate development and solidity in the fore-legs, which are consequently built up, so to speak, on a stronger and bolder scale than the posterior extremities; but with the Megatherium we find the relative proportions reversed: a small head is accompanied by a long neck, and the anterior portions of its body are but slightly weighted in comparison with its abdominal and posterior regions. So exquisite is the foresight, so ingenious the contrivance, which we discover manifested in the smallest details of animal organization! Every want is met as it arises; nowhere does any slovenliness or rudeness prevail, but an abundant provision is made for the comfort, well-being, and completeness of every creature.

To secure strength and facilitate motion for the fore-legs of the Megatherium there exists, then, a peculiar adaptation of the shoulder-blade and collar-bone. But this strength is not merely intended to sustain the weight of the body, nor is this motion designed to be progressive. The humerus articulates with the scapula by a round head, which admits of unrestrained motion in various directions. It is small at its upper and middle part, but at its lower end attains extraordinary breadth, owing to an enormous expansion of the crests which rise from the condyles, to give origin to the muscles for the movement of the fore-foot and toes: just such an expansion, we must observe, as is found in the lower part of the humerus of the ant-eater, which employs its fore-feet in digging up the solid hills of the termite ants. The ulna is singularly broad and powerful at its upper extremity, affording a large space for the origin of the muscles which regulate the movement of the foot.

The entire fore-foot must have been about thirty-six inches long and upwards of twelve inches wide, forming a most efficient instrument for moving the earth from that depth within which succulent roots are generally most plentiful. This great length of the fore-foot, when resting upon the ground, however inconsistent with rapid progressive motion, must have been of the highest value in enabling *one* fore-leg, in conjunction with the hind-legs and tail, to support the whole pressure of the Megatherium's body, while the other fore-leg was exclusively employed in the operation of digging up food.

The fore-foot of the armadillo (*Dasypus peba*), and of the Chlamyphorus, is similarly adapted for digging purposes; and in each may be observed an unusual enlargement and elongation of the extreme bones of the toes for the support of long massive claws. Such, too, was the case with the Megatherium; the bones supporting the claws were composed partly of an axis, or pointed core, which filled the internal cavity of the horny claw, and partly of a bony sheath forming a strong case to receive and support its root. These claws were placed obliquely to the ground, like the digging claws of the mole, and thus were rendered by their very position instruments of greater power for the excavation of the soil.

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* The elephant's tail is remarkably light and slender, being chiefly used to brush off insects; that of the hippopotamus, being intended to act like a rudder when the animal is swimming, is only a few inches long, and vertically flattened.

We must now glance at the posterior extremities of this huge primeval sloth—one of the most interesting animals of the antediluvian world. The pelvis was remarkably expansive and solid. The enormous bones of the ilium were set nearly at right angles to the spine of the back, and were more than five feet asunder at their outer margin, thus considerably exceeding the dimensions across the haunches of the largest elephant. Such proportions would have been highly inconvenient for any animal of ordinary stature, but were probably—we may rather say unquestionably—advantageous to the Megatherium, from its habit of standing for considerable periods on three legs only, while the fourth leg was employed as a digging instrument, or in loosening the roots and overturning the trees on whose foliage it browsed.

But not only was the pelvis distinguished by its breadth and weight; it was also characterized by an unusual arrangement of the acetabulum, or socket, which articulates with the head of the thigh-bones. While in other animals we find this cavity set more or less *obliquely outwards*, so as to facilitate the movement of the hind leg, in the Megatherium it was set *perpendicularly downwards*, over the head of the thigh-bone (*femur*), and unusually near the spine. Thus it obtained increased power of resisting vertical pressure, though its capacity of rapid motion was diminished.

As another illustration of the enormous size and power of the muscles of its thigh and leg, we may mention the fact that the cavity in the sacrum for the passage of the spinal marrow must have been fully an inch in circumference.

The gigantic breadth of the pelvis—and the adjective employed is not an exaggeration—is evidence of the extreme size of the abdominal cavity, of the voluminousness of the viscera, and consequent adaptation to the digestion of vegetable food.

Nor were the form and proportions of the thigh-bone less remarkable. It was nearly three times the thickness of the femur of the largest elephant. Its breadth is nearly half its entire length, and a neck of singular strength and shortness, but twenty-two inches in circumference, united its head to the body of the bone. Its length is two feet four inches; its circumference at the smallest part two feet two inches, and at the largest part three feet two inches. Its body is also flattened, and, owing to this flatness, expanded outwards "to a degree of which nature presents no other example." These peculiarities, remarks Dr. Buckland, appear to be subservient to a double purpose; first, to give extraordinary strength by the shortness and solidity of all its proportions, and secondly, to afford compensation by its external flatness for the weakness which must otherwise have resulted from the inward position of these sockets, by which the femur articulates with the pelvis.

Not less ingeniously was contrived the articulation of the leg with the hind foot, so as to support the enormous downward pressure of the bulky body. The great bone of the instep was nine inches broad and nine inches high, and rested upon a heel-bone of the extraordinary length of seventeen, and the not less extraordinary circumference of twenty-eight inches.

It will readily be understood how solid a support must have been afforded by this colossal bone to that continuous accumulation of weight which we have observed in the pelvis, thigh, and leg. The heel-bone, in fact, occupied nearly one-half of the entire length of the hind foot. The bones of the toes were all short, excepting the extreme joint, which supported the enormous claw; but they were longer than the largest of those in the fore-foot, measuring thirteen inches in circumference, and having within its sheath a core, two inches long, for the support of the claw already mentioned, whose chief use perhaps was to keep the hind foot firmly planted upon the ground.

"Feet and legs thus heavily constructed," says Dr. Buckland, "must have been very inefficient organs of rapid locomotion, and may consequently seem imperfect, if considered in relation to the ordinary functions of other quadrupeds; but, viewed as instruments adapted for supporting an almost stationary creature, of unusual weight, they claim our admiration equally with every other piece of animal mechanism, when its end and uses are understood. The perfection of any instrument can only be appreciated by looking to the work it is intended to perform. The hammer and anvil of an anchor-smith, though massive, are neither clumsy nor imperfect; but bear the same proportionate relation to the work in which they are employed as the light and fine tools of the watchmaker bear to the more delicate wheels of his chronometer."

Our final view of the structure of the Megatherium will be devoted to its bony armour, the characteristic in which it approaches most nearly to the Armadillo and Chlamyphorus. There is reason to believe that its hide was covered with a complete coat of osseous mail, which varied from three-fourths of an inch to an inch and a half in thickness, and resembled the mailed coverings of those living denizens of tropical America. And notwithstanding the great weight of so remarkable "a suit of armour," we cannot pronounce it inconsistent with the general structure of the animal. The huge hind legs and colossal tail of the Megatherium were well able to sustain it; and the strength of the loins and ribs, greatly exceeding that of the elephant, seems to have been designed for carrying the ponderous cuirass which protected its body.

But what was the use of this cuirass? What purpose did it serve? It was probably defensive, protecting the animal, not only against the tusks and claws of the voracious quadrupeds which then existed, but also against the legions of insects engendered by a close and sultry climate, to whose attacks an animal that obtained its food by digging beneath a burning sun would be constantly exposed. We may also infer that it was of advantage in defending the back and upper parts of the body, not only against sun, and rain, and insects, but against the accumulations of sand and dust that would otherwise have maintained a constant state of irritability, and resulted in prolonged disease.

Similar uses seem to be served by the bony covering of the Armadillo and Chlamyphorus, which obtain their food, like the Megatherium, by digging in sandy and sun-scorched plains.

We close our description of the Megatherium in the words of the eminent geologist already quoted :—

"The size of this extraordinary animal exceeds that of the existing Edentata, to which it is most nearly allied, in a greater degree than any other fossil animal exceeds its nearest living congeners. With the head and shoulders of a sloth, it combined in its legs and feet an admixture of the characters of the Ant-eater, the Armadillo, and the Chlamyphorus; it probably also still further resembled the Armadillo and Chlamyphorus in being cased with a bony coat of armour.

"Its haunches were more than five feet wide, and its body twelve feet long and eight feet high; its feet were a yard in length, and terminated by most gigantic claws; its tail was probably clad in armour, and much larger than the tail of any other beast among extinct or living terrestrial mammalia. Thus heavily constructed and ponderously accoutred, it could neither run, nor leap, nor climb, nor burrow under the ground, and in all its movements must have been necessarily slow; but what need of rapid locomotion to an animal whose occupation of digging roots for food was almost stationary? and what need of speed for flight from foes to a creature whose giant carcass was encased in an impenetrable cuirass, and who by a single pat of his paw, or lash of his tail, could in an instant have demolished the couguar or the crocodile? Secure within the panoply of his bony armour, where was the enemy that would dare encounter this leviathan of the Pampas? Or in what more powerful creature can we find the cause that has effected the extirpation of his race?

"His entire frame was an apparatus of colossal mechanism adapted exactly to the work it had to do; strong and ponderous in proportion as this work was heavy, and calculated to be the vehicle of life and enjoyment to a gigantic race of quadrupeds, which, though they have ceased to be counted among the living inhabitants of our planet, have, in their fossil bones, left behind them imperishable monuments of the consummate skill with which they were constructed; each limb, and fragment of a limb, forming co-ordinate parts of a well-adjusted and perfect whole; and through all their deviations from the form and proportion of the limbs of other quadrupeds, affording fresh proofs of the infinitely varied and inexhaustible contrivances of creative wisdom."

These are considerations which should never be forgotten by the student of natural history.

The family *Megatheriidæ* of Professor Owen includes several allied genera of huge Edentata, as the Megalonyx, the Mylodon, and the Scelidotherium, which are chiefly distinguished from the Megatherium by dental peculiarities. Their fossil remains have all been discovered in the superficial stratum of the Pampas of South America.

The *Mylodon* (*i.e.*, Grinder-teeth) was an animal of gigantic size, with a short massive neck and a bulky body, like that of the rhinoceros, but in habit and general structure resembling the Megatherium. It had eighteen teeth—five on each side in the upper, and four in the lower jaw; they were long, simple, fangless, uniform in substance, and nearly straight, with the exception of the first tooth in the upper jaw, which was slightly curved. From the conformation of its jaws, and its dental characteristics, this animal is supposed to have fed, like the elephant or the sloth, on the leaves or slender terminal twigs of trees, which its immense strength and the arrangement of its lower limbs enabled it to uproot and level to the ground.

"They may be supposed," says Professor Owen, "to have commenced the process of prostrating any particular tree by scratching away the soil from the roots, for which office we find in the Mylodon the modern scansorial fore-feet of the sloth, modified after the type of that of the partially fossorial ant-eater. The compressed or subcompressed form of the claws which detracts from their power as burrowing instruments, adds to their fitness for penetrating the interspaces of roots, and for exposing and liberating them from the attached soil. This operation having been duly effected by the alternate action of the fore-foot, aided probably by the unguiculate digits of the hind feet, the long and curved fore-claws, which are habitually flexed and fettered in the movements of extension, would next be applied to the opposite sides of the loosened trunk of the tree, and now the Mylodon would derive the full advantage of these modifications of its fore-feet by which it resembles the Bradypus; the correspondence in the structure of the prehensile instruments of the existing and extinct sloth, extending as far as was compatible with the different degrees of resistance to be overcome."

Mylodon robustus.

In the small climbing sloth the claws are long and slender, for they have only to sustain the weight of its little body, which is approximated by the action of the muscles towards the grasped branch, as to a fixed point. The stouter proportions of the prehensile hooks of the Mylodon accord with the harder task of overcoming the resistance of the part seized, and bringing it down to the body.

For the long and slender branchial and anti-branchial bones of the climbing sloth we find substituted in its gigantic predecessor a humerus, radius, and ulna of more robust proportions; of such proportions, indeed, in the *Mylodon robustus*, as are unequalled in any other known existing or extinct animal.

The tree being thus partly undermined and firmly grappled with, the muscles of the trunk, the pelvis, and the hind limbs, animated by the nervous influence of the unusually large spinal chord, would combine their forces with those of the anterior members in the efforts at prostration.

"And now," says Professor Owen, "let us picture to ourselves the massive frame of the Megatherium, convulsed with the mighty wrestling, every vibrating fibre reacting upon its bony attachment with a force which the sharp and strong crests and apophyses loudly bespeak. Extraordinary must have been the strength and proportions of that tree, which, rocked to and fro, to right and left, in such an embrace, could long withstand the incessantly repeated efforts of its ponderous assailant."

A complete skeleton of the Mylodon was discovered at Buenos Ayres. It measured eleven feet from the fore-part of the skull to the end of the tail. It probably belonged to a young individual.

Our survey of the animal life of the Pleistocene period next brings us to the *Glyptodon*, another of the South American quadrupeds, covered, like the modern armadilloes, with a stout, tesselated, bony armour. In size it equalled the largest rhinoceros. It was, in fact, a colossal or magnified armadillo, which it resembled in its habits, food, and principal structural peculiarities. "Otherwise its armour," as a writer has pithily observed, "would cover more than a score of armadilloes."

It is obvious, however, putting aside the question of *bulk*, that the marked peculiarity of the Pleistocene period is the approximation of its forms of animal life to those of the present age. The megathere is the natural forerunner of the sloth; the glyptodon of the armadillo; the mammoth of the existing elephant; the macrauchenia of the modern llama; and the merycothere of the camel.

In the Eocene stage of the Quaternary epoch we find the fauna of Europe characterized by its palæotheres, anoplotheres, xiphodons, river-hogs, alligators, crocodiles, gavials, and turtles; in the Pleiocene sub-period these decline, or become extinct, and their places are occupied by mastodons, mammoths, deinotheres, camels, giraffes, cave-bears, lions, and hyænas. We come still nearer to what we may call the modern world, and in the Miocene period distinguish, as the principal forms of quadrupedal life, mammoths, hippopotami, rhinoceroses, antelopes, wild oxen, tigers, bears, and horses. A similar gradation is noticeable in Asia, where the middle sub-period was characterized by numerous species of sivatheres, elephants, camels, lions, tigers, giraffes, crocodiles, and huge tortoises; the upper period, by the horse, ass, urus, rhinoceros, and mammoth. The forms of North America are so like those of Europe as to suggest the existence of a closer communication between the two continents in those days than now obtains. In South America we ascend by a succession of similar stages to the megathere, the scelidothere, the megalonyx, the mylodon, the glyptodon, and the macrauchene. The remarkable Marsupials of Australia were similarly anticipated by the gigantic Diprotodon; the wingless birds of New Zealand by the Palæpteryx and the Dinornis; and the African ostrich by the huge Epiornis of Madagascar.

We shall close our sketches of the natural history of the primeval world with a glance at the last-named forms of animal life—the wingless birds.

The *Dinornis** is a genus of large birds of the tribe *Brevipennes*. No species of it is now known to exist, but its bones have been discovered in the upper Pleiocene deposits in New Zealand—in caves, in marshes, in beds of rivers, and on the sandy shore. From certain traditions still current among the natives this bird would seem to have survived, along with its congeners the Palæpteryx and Aptornis, to the close of the seventeenth or beginning of the eighteenth century. Its New Zealand name is *Moa*. It is said to have been hunted for the sake of its flesh and the beautiful feathers of its plumage. It was a stupid, lethargic bird, incapable of flight, and living upon vegetable food in the sequestered depths of the forests, or on the topmost crags of the mountains. In size it greatly exceeded any living bird, some of its bones being double the dimensions of those of the ostrich, while the body was even disproportionately bulkier. The legs were long, and the Dinornis probably stood

Dinornis and Bos.

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* From δεινος, terrible; and ορνις, a bird.

thirteen or fourteen feet in height. The framework of the leg is of a singularly massive character, and the entire skeleton is remarkable for its solidity.

It was from the examination of a single bone of this strange bird that Professor Owen, in 1839, before any complete remains had been discovered, built up conjecturally its entire structure, determined its most important characters, and assigned to it its true place in the scheme of nature—an interesting proof of the value of comparative anatomy, and a strong testimony to the degree of perfection which that science has attained.

Several species have been distinguished, as—*Dinornis elephantopus*, *Dinornis ingens*, and *Dinornis giganteus.*

The *Palæpteryx*, or ancient Apteryx, is another genus of fossil birds whose remains have been discovered in the Pleiocene deposits of New Zealand. In the form of the sternum, and the structure of the legs and pelvis, it resembled the living Apteryx, a bird not unlike the penguin, about two feet in height, with merely rudimentary wings, and a very long, slender bill. The New Zealanders, in allusion to its peculiar cry, call it *Kiwi-kiwi.*

The *Epiornis*, a bird much larger than the ostrich, but of the same character, would seem to have been at one time indigenous to Madagascar, probably when that island was a portion of a vast eastern continent, long ago submerged. The eggs of this bird may possibly have suggested the fable of the roc's egg in the story of "Sinbad the Sailor;" for, from specimens brought to Europe, it is evident they were capacious enough to hold the contents of two hundred and forty hen's eggs of the ordinary size.

The Quaternary epoch is that which geologists consider to have immediately preceded the great deluges. Sir Charles Lyell and some other men of scientific reputation prefer to call it the Post-Tertiary epoch, and they subdivide it into—

1. The Post-Pleiocene period;
2. The Recent, or Upper Post-Pleiocene.

Whichever division or designation we adopt, it seems certain that after the Pleiocene period and before the creation of man intervened two remarkable periods; that of the European deluges, and that which is known as the Glacial.

The Pleiocene period gradually declined in temperature, until a climatic condition prevailed utterly incompatible with the existence of the former fauna and flora. The animals and plants which succeeded belonged to genera capable of enduring a low temperature, and finding subsistence on a frozen earth.

Thus, in the accompanying illustration (Plate 10), we find the bear seated at the mouth of its den or cave, and gnawing the bones of the elephant. On the high ground above the Hyæna spelæa watches with savage eye the moment when it may pounce on the food thrown aside by its formidable rival. The great wood-stag, and other semi-gigantic animals of the epoch, stalk along the farthest shore of a narrow lake, where some small hills emerge from the valley, clothed with pine and fir and other hardy trees. Mountains of recent elevation lift their huge bulk against the horizon, wrapped in a shroud of frozen snow, to remind us that the Glacial period is approaching, and that its influence is already making itself felt.

The most abundant fossil remains belonging to the Post-Pleiocene are those of the elephant and the horse. The extreme profusion of the bones of the mammoth, embedded in the latest deposits of the globe, is only surpassed, we are told, by the prodigious quantity of the bones of the horse, which lie buried in the same formations. The extraordinary plenty of the remains of these two animals is a satisfactory proof that, during the Quaternary epoch, the earth was inhabited by these in immense herds. "It is probable that from one pole to the other, from the equator to the two extremities of the axis of the globe, the earth must have formed a vast and almost limitless prairie, overspread by a magnificent carpet of verdure. So abundant a pasturage would be absolutely needful for the support of these prodigious troops of herbivorous animals of great size."

In the Western hemisphere we may conjecture that a more genial temperature prevailed than in the Eastern. Over its verdant plains, and under a warm and sunny sky, roamed gigantic pachyderms, colossal in proportions, but of harmless and gentle disposition. Sometimes they would seek the shade of the primeval forest, and among the tall trees, festooned with parasites and creepers, would be gathered, perhaps, such a group as our artist has depicted in the accompanying illustration (Plate 11). Here we see the Glyptodon crawling to the water's edge, the huge Megatherium bringing down a tree that it may feed on its tender shoots and succulent buds, the elephant meditating in the cool shades; while, undaunted by the immediate neighbourhood of the gigantic Mastodon, a couple of monkeys are disporting themselves among the herbage. A small ape, the Cercopithecus, which first made its appearance in the Miocene period, is climbing a pliant stem with wonderful agility. The vegetation is identical with that which flourishes in tropical America at the present time.

In upon all this abundant life broke—so far, at least, as the Old Continent was concerned—a succession of terrible and destructive deluges, produced, perhaps, by the sudden upheaval of some vast extent of dry land, by the formation of some mountain or mountain-range in the vicinity of the sea, or by the elevation of some portion of the sea-bed itself. These commotions would necessarily pour a vast body of water over the earth, with extraordinary violence; inundating the plains, filling up the valleys, sweeping away the grove, the wood, and the forest, and spreading everywhere ruin and destruction. A recent writer observes that of two such deluges in one hemisphere there is indisputable evidence, and he names them the European and the Asiatic. The former occurred before, and the latter after, man's creation. The former consisted in fact of two cataclysms; of which the first occurred in the north of Europe, through the upheaval of the Scandinavian mountains. "Commencing," he says, "in Scandinavia, the torrent spread and carried its ravages into the regions now known as Sweden, Norway, European Russia, and Northern Germany, sweeping before it all the shifting soil on the surface, and covering the whole of Scandinavia, all the plains and valleys of Northern Europe, with a diluvial deposit. As the districts where this vast mountainous elevation took place, and the seas surrounding them, were partially frozen and clothed in ice, owing to their elevation and neighbourhood to the pole, the flood which devastated them swept along with it enormous masses of ice. The shock produced by their collision would serve to increase the extent and intensity of the ravages occasioned by this awful convulsion."

The second European deluge originated, it is supposed, in the formation and upheaval of the Alps, filling with ruin and wreck the great valleys of France, Germany, and Italy, which radiate from those huge mountain masses as from a central point.

To dwell on these events would carry us too far from the immediate purpose of the present work. They belong to the province of the geologist, rather than to that of the naturalist. Some notice of the changes undergone by the primeval world was, indeed, indispensable, to explain to the reader the changes which took place at different epochs in the primeval fauna; but we must now draw to a conclusion our brief and desultory observations.

We find, thus, that in the last scene of this strange, eventful history—the Glacial period—"the entire range of animated nature, the evolution of animals, was then suddenly arrested in that part of our hemisphere over which those gigantic convulsions spread; followed by the brief but sudden submersion of entire continents. Organic life had scarcely recovered from this awful blow, before it was assailed by a second and, perhaps, a severer. All Northern and Central Europe—all the wide region extending from Scandinavia to the Mediterranean and the Danube—were suddenly visited by a period of excessive cold; were seized within the numbing grasp of an arctic atmosphere. The plains of Europe, ornamented only a short time before by the luxuriant vegetation of a tropical climate—the boundless pastures where herds of elephants, the nimble horse, the robust hippopotamus, and the great carnivorous animals roamed, and made war against each other—were covered all at once with a shroud of ice and snow."

The phenomenon is variously explained, but the fact is, human knowledge is unable to propose any satisfactory explanation. It was probably the result of a combination of causes, among which a sudden disturbance of the parallelism of the axis of rotation may have occupied a foremost rank. All we know is—and this the earth itself sufficiently demonstrates—that such a phenomenon actually took place, and in many a European valley we can trace the progress of the vast masses of ice and the huge glaciers which it originated and set in motion. We can observe how they smoothed, and polished, and striated the rocks over which they passed. Enormous boulders, or erratic blocks, lying at great distances from their ancient positions, are mute but eloquent memorials of the Glacial period—the Age of Ice. How long it lasted we cannot even guess, but after a while—after a lapse of years which to man might seem an eternity, but to the Creator was only as a moment—the earth resumed its normal temperature, the grasses sprang afresh over plain and valley, the trees once more waved in numerous forests, animal life again appeared on the surface of the globe, and—

GOD CREATED MAN.

THE MUSEUM
OF
NATURAL HISTORY.

ZOOLOGY.

VERTEBRATE ANIMALS—(VERTEBRATA.)

WHEN the immortal Cuvier published his new arrangement of the Animal Kingdom, he divided all animals into four principal sections, which we still find adopted, with some modifications, by most naturalists. The changes which have been made in the contents of these great divisions, in accordance with the progress of zoological science since the death of the great French comparative anatomist, have principally affected the three lower groups established by him, and the limits of his first and highest division of animals, that of the Vertebrata, have remained without alteration. This, indeed, is no more than might have been expected. The vertebrate animals are those whose existence has always, from various circumstances, been pressed most forcibly upon the notice of mankind. Vertebrate animals furnish the greater part of our daily food, and amongst them are to be found our most dangerous enemies, so that the mere instinct of self-preservation must have early led even the uncivilized man almost unconsciously to the study of their natural history. Hence, the knowledge of the differences and agreements in the structure of these creatures had made great progress, even in the popular mind, at a period when the greatest philosophers knew little of the remainder of the animal kingdom; and Linnæus, in dividing the whole of animated nature into six classes, gave no fewer than four to the creatures which we now distinguish as Vertebrata.

The name of *Vertebrata* or *Vertebrate animals*, given to this great section of the Animal Kingdom, has reference to one of its principal characters, namely, the possession of a backbone (spine or *vertebral column*), composed of numerous joints (*vertebræ*) attached firmly to each other, but in such a way as, in most cases, to insure more or less flexibility.

The office of this bony column is twofold. In the first place, by its enlargement into the hollow case called the *skull*, and by the presence of apertures in each of its joints, which, when placed in their proper position, form a continuous tube or canal running down the back of the animal—it furnishes a protection for the brain and spinal marrow (spinal cord), the great centre of the nervous system, which in these creatures attains a high degree of development. In the second place, by affording support to numerous other bones, varying in form and arrangement according to the duties they have to perform, it constitutes the centre of the skeleton of these animals—a sort of bony framework which at the same time serves to protect the more important internal organs, and to furnish solid points of attachment for the muscles by which the movements of the various parts are effected.

This framework of bones consists, in addition to the skull and spinal column already referred to, of the ribs, and of the bones of the limbs—the former, as is well known, constituting a series of long curved bones which inclose the cavity of the chest, and are for the most part movably articulated to the vertebræ on each side. The opposite extremities of the ribs are also usually united to a single bone, which occupies the centre of the anterior or inferior surface of the chest, called the breastbone (or *sternum*); and in most air-breathing Vertebrata the whole framework of the chest is capable of moving by the action of the muscles attached to the ribs, in such a manner as to increase or diminish the size of the cavity inclosed by them, thus causing the lungs to be alternately filled with and emptied of the air necessary for respiration. The vertebræ which bear the ribs are usually distinguished by several peculiarities of construction from those of the other parts of the spinal column; they are called *dorsal vertebræ*, or vertebræ of the back; those in front of them, forming the neck, are called *cervical vertebræ*, and those behind them, which are usually of great size, are called *lumbar vertebræ*, or vertebræ of the loins. The latter are followed by the vertebræ which support the hinder extremities; and these again, in most of these animals, by a number of vertebræ, gradually diminishing in size and completeness, which form the tail. These are the *caudal* vertebræ.

Of limbs in the Vertebrata there are never more than two pairs. The anterior limbs are usually attached to the body by being articulated to a pair of flat bones called the shoulder-blades, which lie upon the ribs, and are kept in their proper position partly by the action of powerful muscles, and partly by the support afforded them by one or two pairs of bones which spring from the front of the breast-bone; these bones are often wanting. The hinder extremities, on the contrary, are usually articulated to a strong bony ring or basin (the *pelvis*) which is firmly attached to the vertebral column below the loins; the vertebræ of this part of the spine being also completely united to each other, so as to form a single bony piece (the *sacrum*).

In the essential structure of the limbs there is a wonderful uniformity throughout the whole of this great group of animals. Each limb consists of four distinct parts, which correspond exactly in the anterior and hinder extremities, although, in conformity with the usages of human anatomists, they have received different names in the two pairs. In the fore-limb the bones are the arm-bone, the two bones of the fore-arm, the bones of the wrist, and those of the hand; in the hind-limb they are the thigh-bone, the two bones of the shank, the heel-bones, and those of the foot. The arm-bone and thigh-bone (*humerus* and *femur*) articulate respectively with the shoulder-blade and pelvis; they are single bones, usually of a cylindrical form. The fore-arm and the shank include two parallel bones (called the *ulna* and *radius* in the arm, the *tibia* and *fibula* in the leg), one of which, in each member (the *ulna* and the *tibia*), is united by a hinge-like joint with the lower extremity of the arm or thigh-bone, forming the elbow or the knee. The other bones (*radius* and *fibula*) are scarcely, if at all, attached at this joint; they are consequently capable of rotating to a certain extent, and thus enable the hand or foot to be turned in various directions. It is to the broad extremity of these latter bones that those of the wrist and heel (*carpal* and *tarsal bones*) are attached; these are numerous short bones, packed closely together, but still capable of a greater or less freedom of motion. They are followed by the bones of the hand and foot (*metacarpal*, *metatarsal*, and *digital bones*), which frequently form five rays of three or four joints in each, starting from the wrist or heel. Of these the metacarpal and the metatarsal bones constitute the palm of the hand and the sole of the foot in man; the digital bones, which are also called *phalanges*, form the fingers and toes.

It is not to be supposed, however, that all these parts present themselves to our notice with equal distinctness in every creature formed upon what is called by naturalists the vertebrate type; in fact, we meet with an almost endless variety of modifications in the different regions of the body, but especially in the limbs; and the study of these modifications, of the wonderful series of changes, by which the Creator of all things, submitting himself, as it were, to a self-imposed law, has adapted the same general type of structure to the most dissimilar purposes, is not only one of the most interesting branches of zoology, but also one of the most striking proofs furnished by natural theology of the prevalence of an intelligent design in Animated Nature.

It is the business of the philosophical anatomist to investigate these marvellous modifications of structure; to trace the plan by which the same organs have been adapted to the most different offices, and to endeavour, by deducing therefrom the abstract or ideal form from which all the special structures presented to our observation may be derived by variations in the degree of development of the different parts, to obtain a type with which things, apparently the most dissimilar, may be compared: and thus to enter, as it were, into the mind of the great Designer of the universe. It is, however, unnecessary here to dwell at any length upon this most interesting branch of science, and we shall therefore content ourselves with giving a very brief abstract of the general results which have been obtained by much earnest thought on the part of some of the greatest minds of the present century.

According to the generally received views, the skeleton of a vertebrate animal is composed of numerous segments or vertebræ (the latter term being used in an ideal sense). Even the skull itself is proved to consist of several vertebræ developed in a remarkable manner—the bones of the face holding the same relation to those of the true skull, that the ribs do to the superior arch of the dorsal vertebræ through which the spinal cord passes. The four limbs are appendages of two particular vertebral segments; and similar appendages are met with in a rudimentary form upon other segments in some animals.

Regarding the skeleton in accordance with these views, as consisting ideally of a series of similar segments, we find that it is by the suppression of certain parts of some of these, and the greater or less development of others, that the varied forms of vertebrate animals are produced. The appendages constituting the limbs are, as already stated, usually suppressed completely in all but two segments, and the ribs often share the same fate in the neck, loins, and tail. In other cases the bones of one or both pairs of limbs are wanting, and in some of the lowest forms we find nothing left but the vertebral column itself, which sometimes is not even ossified, but consists of a gelatinous or cartilaginous cord, running, with little or no trace of any division into vertebræ, from the head to the extremity of the tail.

Yet throughout all these variations the intelligent observer traces one uniform plan: the great centre of the nervous system always consists of a brain and spinal cord, supported in all but one instance, by a structure which may be recognized as a vertebral column; the jaws are always supported by bones or cartilage beneath the skull, and their opening is always horizontal; the limbs are never more than four in number; the heart is always muscular, and connected with a distinct system of vessels, through which courses a blood, coloured red by innumerable globules; and the organs of the four special senses (sight, hearing, smell, and taste) are almost always highly developed, and invariably placed in cavities of the face and head. The viscera are very similar in their nature throughout the entire group, and the animals are always male or female, never hermaphrodite.

CLASS I.—MAMMALIA.

IN whatever light we consider the general arrangement of the animal kingdom, the Mammalia must always occupy the highest place in the system. Both in complexity of organization and in general intelligence, the members of this class, which even includes our own species, bear the palm from all other animals; and, if we descend to purely utilitarian views, it is amongst the ranks of the Mammalia that we must seek for all the most valuable of those creatures which have been in every age most serviceable to the human race, and have contributed most importantly to the progress of civilization. The noble and generous horse, who lends his back to the burden and his neck to the yoke with equal readiness; the brave and faithful dog, the constant friend and companion of man in all countries, and his firm ally in the subjugation of other animals; the camel, the far-famed "ship of the desert," without whose patient endurance and great strength the vast sandy plains of Africa and the desert steppes of central Asia, would have presented a more serious obstacle than even the ocean itself to the intercourse of the eastern nations; the cattle and sheep which constitute the riches of pastoral tribes, and without which an advanced civilization would be almost an impossibility: these are only a few of the important species of the class Mammalia, which have been in all times subjected to the dominion of man. We may seek in vain in any other class of animals for even a single species that may be compared with one of these.

Notwithstanding the great importance of the Mammalia, however, we have no English word to express the whole class, although the great majority of them may come under the denomination of *beasts*. The term *quadrupeds*, which also applies to the majority, is likewise inadmissible, both because it is equally applicable to many reptiles, and because some true Mammalia are not furnished with four feet. We are therefore reduced to the employment of the term *mammals*, to express the animals now under consideration in a general sense; as this term, derived from the Latin word *mamma*, a breast or teat, expresses the leading peculiarity by which these creatures are distinguished from all other animals—namely, that of nourishing their young, which are born alive, by means of a secretion produced by certain glands placed on the chest or abdomen of the mother.*

Independently of the physiological characters derived from the viviparous reproduction and the provision of milk for the nourishment of the young, which prevail in all the animals of this class, we find in other points of their structure an abundance of peculiarities by which they may readily be distinguished from the rest of the Vertebrata. They all breathe air by means of lungs, consisting of a minutely cellular structure, suspended freely in the cavity of the chest, and unconnected with any air-tubes or sacs penetrating the other organs of the body, as in Birds. The chest is separated from the abdominal cavity by a muscular and tendinous partition called the *diaphragm*, the movement of which, by enlarging the cavity of the chest, is one principal cause of the inspiration of air. The heart contains four cavities, two ventricles for the propulsion of the blood through the arteries, and two auricles for its reception from the veins; this character is common to the Mammalia and Birds. The mouth is closed by fleshy lips, which are almost always movable; and the skin, with but few exceptions, is more or less covered with hair.

The structure of the skeleton also furnishes most important characters in this, as in other classes of vertebrata. The bones are, for the most part, destitute of air-cells, and where these exist, they do not communicate with the lungs. Most of the bones are solid, and those which possess cavities (such as the thigh-bones and arm-bones) have them filled with a peculiar fatty substance, well known as marrow. Air cavities in the bones are usually confined to the head, where they are commonly known as *sinuses;* these attain a great development in the ruminating quadrupeds, such as the sheep and deer, and in the elephant the great size of the skull is mainly due to the large air-cells which separate the two faces of the cranial bones.

The body of a mammal is usually divided into three portions—the head, neck, and trunk; and these are, in most cases, clearly distinguishable even in the living animal. In the skeleton, as will be seen by a glance at plates 32, 33, 34, they are still more strongly marked, and we find that in this we may again divide the bones of the trunk into several distinct systems—namely, the dorsal vertebræ, with the ribs; the lumbar vertebræ, forming the loins; and the sacrum, bearing the supporting arch of the hinder extremities; beyond which the vertebral column is usually continued into a gradually decreasing series of vertebræ, forming the tail.

The skull, including all the bones of the head, presents the following leading characters in mammals:—The cranium, or true skull, containing the cavity for the reception of the brain, is of larger comparative size in these than in any other Vertebrata; its bones are immovably connected with each other, and with those of the upper jaw and face, a character which is peculiar to these animals. The occipital bone, which forms the base of the skull, and is perforated by the large aperture for the passage of the spinal cord, bears a pair of articulating tubercles by which the skull is attached to the first vertebra of the neck. The upper jaw is formed by two maxillary and two intermaxillary bones, which bear teeth in a single row along their margins. The two halves of the lower jaw consist each of a single bone; they are united in front either by a cartilage or by a suture, or sometimes, as in man, the two sides of the jaw are completely amalgamated so as to form one bony piece. The lower jaw in the Mammalia is articulated directly to the skull, without the intervention of any other movable bone.

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* The Germans have the expressive term *Säugethiere*, or sucking animals, for this class. The term *Mammifères*, or teat-bearers, is in ordinary use amongst French writers, and of course refers to the same character as the term *Mammalia* here adopted. The name *Pilifères*, applied to the class by De Blainville, in allusion to the hairy covering of most of the species, has never been much made use of.

The jaws, as already intimated, are furnished with teeth, and these exhibit a great diversity in their form and structure. They are always implanted in sockets of the jaws, and these are lined by a delicate membrane, so that the teeth are never anchylosed or completely united to the bone of the jaws. The teeth consist of a hard substance called *dentine*, defended by a coating of *enamel*, and covered by a layer of a third substance called *cement*. The latter is very thin on the crown or exposed portion of the tooth in man and many animals, which have teeth similar to those of the human species; but in the teeth of many herbivorous mammals the cement acquires a great development, and vertical folds of this substance and enamel penetrate the dentine of the crown, thus giving rise, as the teeth are worn away, to an uneven surface eminently adapted to the comminution of tough vegetable matters.

A few species are entirely destitute of teeth; in others a few of the teeth are wanting, or some of them undergo peculiar modifications to adapt them to particular purposes. But in the majority we find four different sets of teeth called respectively the *incisors*, or cutting teeth; the *canines;* the *premolars*, or false molars; and the *molars*, or grinders. The incisors or cutting teeth are inserted in the intermaxillary bones in the upper jaw, and occupy the corresponding place in the lower one. Their number varies from two to ten, and their form is also subject to much diversity; but they are usually flattened transversely, so as to form a cutting edge across the front of each jaw.

The canines, so called from their large size in the dog, are also very large in all carnivorous mammals. In the human subject the upper ones are frequently called eye-teeth, from their being placed directly beneath the eyes. Of the canines we find one on each side in each jaw; the upper ones are inserted at the anterior angles of the maxillary bones, and the lower ones in a corresponding position in the lower jaw. When most largely developed, they form long, curved, conical, acute teeth, capable of inflicting the most serious wounds.

The premolars, which are usually three or four in number on each side, are generally separated by a short interval from the canines, which they frequently resemble in having only a single root; their crown is usually broad and tubercular or ridged, in a manner more or less resembling that of the true molars. The latter, of which there are also commonly three or four on each side, are the largest and strongest of all the teeth, and are implanted in the jaws by two or more roots, a character peculiar to the Mammalia, and one which is often of the greatest importance to the palæontologist in determining the nature of those fossil remains by which a certain light has been thrown upon the former history of our planet. The molars, of all the teeth, are those which appear to undergo the greatest amount of modification to fit them to the habits and food of the animals. In the carnivorous forms we find them furnished with sharp cutting edges, and fitting together like the blades of a pair of scissors; in those which prey principally upon insects, whose hard and slippery armour renders them rather difficult to be disposed of, the molars are furnished with a double row of sharp points, from which even the hardest beetle could not find it easy to escape; in those which, like the monkeys and our own species, feed upon fruits or upon a mixed diet of soft animal and vegetable substances, the crowns of the molars are of a more or less cubical form, with the surface divided into several blunt tubercles by furrows which traverse it in different directions; and lastly, the strictly herbivorous species usually present an intermixture or alternation of the three substances of which the teeth are composed, such as produces a series of ridges upon their surface, as they are gradually worn down during the trituration of the food.

The teeth are produced from a pulpy germ or matrix contained within the jaw, and in the majority of the Mammalia the activity of this germ continues after it has served for the formation of the series of teeth first produced. These, which are commonly known as the *milk-teeth*, are shed at a certain period of life, when their places are taken by new teeth adapted to the increased size of the jaw. The milk-teeth include the incisors, the canines, and three or four molars on each side; the two former groups are replaced by new incisors and canines; the deciduous molars are shed to make room for the premolars, whilst the true molars are produced later than the other teeth, and are never changed. The teeth of the Mammalia are never shed more than once; but, in some forms, the formative pulps of some of the permanent teeth continue in activity during the whole life of the animals, and thus the teeth are constantly growing at the root. As these modifications of the teeth are usually characteristic of certain orders of Mammalia, they will be more particularly referred to hereafter, when the beautiful adaptation of their structure to the habits of the animals will be more clearly seen.

The general structure of the skeleton will not detain us long, as it nearly agrees with that already described (pp. 1, 2), as the most perfect development of the vertebrate type. The vertebral column, or back-bone, as it is usually termed, is divided into several regions, as has been already stated: these are called the *cervical*, *dorsal*, *lumbar*, and *sacral* regions, or the regions of the neck, back, loins, and sacrum; and the continuation of the vertebral column into the tail, when this exists, constitutes the *caudal* region. The same names are applied to the vertebræ composing each region.

Of the cervical vertebræ there are almost invariably seven; and this is the only region of the body in which the number of vertebræ is at all constant.* Whatever may be the length of the neck in these animals, the number of the vertebræ is the same; the short neck of the human subject, and the enormously long one of the giraffe, each contain seven vertebræ, although the one constitutes only one-seventh and the other three-sevenths of the entire vertebral column. In the whales the vertebræ of this region of the body are completely united together, to form a single bone. Except in the sloths, all the cervical vertebræ are destitute of ribs, and the spinous processes gradually increase in height as we recede from the head. The first two vertebræ, however, in the Mammalia, present peculiarities of structure which have obtained them distinct names in all systems of anatomy. The first, called the *atlas*, forms a bony ring, bearing on its upper surface a pair of cuplike depressions for the reception of the prominent condyles or articulating tubercles of the base of the skull (see p. 3); by means of this articulation the head is enabled to move up and down. The second vertebra is called the *axis*, from its possessing a peculiar process which projects forward into the ring of the first, and articulates with a flat surface on the inside of its anterior part. By this arrangement the rotatory movement of the head is effected.

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* The only exceptions to this rule are presented by the Sloths, in which the neck contains eight or nine vertebræ: and by the Southern Manatee (*Manatus australis*), which usually has only six cervical vertebræ.

The dorsal vertebræ are usually thirteen in number; but this general rule is liable to many exceptions. The foremost dorsal vertebræ usually have their upper spinous processes greatly developed, especially in animals possessing long necks or heavy heads; these processes and those of the posterior cervical vertebræ give attachment to a strong ligament (the *nuchal* ligament), which powerfully aids in supporting the head, and in some animals is continued backward as far as the loins. The dorsal vertebræ are distinguished from the rest by their bearing the articulating surfaces for the ribs, which are confined to this region of the body. The ribs are long, usually slender, curved bones, which articulate by their heads with the bodies of two vertebræ, and are nearly always supported by a tubercle against the transverse processes of the hinder of these. The anterior or true ribs are united by cartilaginous pieces with the sternum or breast-bone, which occupies the centre of the anterior or lower part of the chest. Behind these are some shorter ribs, commonly known as false or floating ribs, which are never united directly with the sternum, but only by the intermediation of a common cartilaginous band.

Of the lumbar vertebræ there are usually six or seven, but the number varies from two to nine. They are usually larger in the body than the dorsal vertebræ, and the lateral processes are often greatly developed; they are distinguished from the dorsal vertebræ by the absence of ribs, and of the surfaces for the attachment of the latter. Behind the lumbar region comes the sacrum, a single bony piece, which sometimes consists of only one vertebra, but is usually composed of three or four amalgamated together, bearing traces of its compound nature in the apertures which indicate the original points of separation of the distinct vertebræ. This bone gives a firm attachment to the *pelvis*, or supporting arch of the hinder limbs, which will be described in treating of those members. The caudal vertebræ are usually numerous, amounting to as many as forty-six in the long-tailed manis. The smallest number of distinct joints is four; but in the human species, and in some others, the caudal region of the vertebral column is reduced to a mere rudiment.

The structure of the limbs is nearly identical with the description of the typical conformation of the extremities of the vertebrata already given. The anterior limbs are always present in mammals; the posterior are sometimes deficient. The former are articulated to a shoulder-blade or scapula, Q, a flat and somewhat triangular bone, usually provided with a strong ridge on its upper surface, which lies amongst the muscles upon the anterior ribs. The shoulder-blades are frequently supported in their position by collar-bones or clavicles, which spring from the fore part of the sternum, and at the opposite extremity articulate with the lower part of the shoulder-blade. These, however, are sometimes wanting, or imperfectly developed. The coracoid bones, which form an important part of the supporting arch of the anterior members in Birds and Reptiles, constituting, in fact, a second and even more powerful pair of collar-bones, only occurs in its full development in one small group of mammals; in the rest it is reduced to a rudimentary condition and amalgamated with the shoulder-blade, of which it forms a small process.

The anterior limb itself usually consists, as previously stated, of the arm-bone or *humerus*, R; the *radius* and *ulna*, S, T; the *carpus* or wrist, U; the *metacarpus* or hand, V; and the fingers, W. These parts all undergo great modifications, not only as regards their form and comparative size, but also by the amalgamation, or total suppression of some of their subordinate constituents. Thus, in the monkeys, Plate 34, fig. 111, we generally find all the parts fully developed, and almost equal in perfection to the same parts in man; in the carnivorous beasts, Plate 33, fig. 105, the various portions of the apparatus are still very distinct, but the great mobility they possess in man and the monkeys is already considerably diminished, to adapt the limbs to the purposes of terrestrial progression; in the seals, Plate 34, fig. 114, and the cetacea, Plate 34, fig. 109, we still recognize the same parts, but with their mutual powers of motion still further limited, to fit them to act as paddles in the water. The ant-eater and the sloth, Plate 33, fig. 107, and Plate 34, fig. 112, also exhibit the same structure, modified in its details to suit particular purposes, and in the latter case displaying a diminution in the number of fingers. With the exception of the aquatic seal and dugong, all the animals to which we have hitherto referred are either terrestrial or arboreal in their habits; but in the bats, Plate 34, fig. 110, we find the anterior limbs adapted for the purpose of flight. In these the arm-bone, R, is not very disproportionately elongated, but the bones of the fore-arm, S, the metacarpal bones, V, and the phalanges or finger-bones, W, are of immense length, and these, by stretching a leathery membrane which unites them, enable the bats to raise themselves into the air, and to fly through that element with great swiftness.

In the terrestrial animals to which we have already referred, the radius and ulna were still capable of a certain amount of rotatory motion, although not to the extent presented by the monkeys. In the herbivorous terrestrial mammals, the toes are terminated by hoofs, by which means the feet are at once admirably adapted for long-continued and swift motion, and completely deprived of all prehensile power. The faculty of turning the fore-foot, consequently, becomes unnecessary, and we find, accordingly, that in the hoofed animals, the radius is reduced to a perfectly rudimentary condition, or amalgamated with the ulna, or altogether suppressed. In the hog, fig. 108, Plate 33, the metacarpal bones and phalanges, of which we find four series, remain distinct, but only the two middle toes reach the ground; the others terminating in the two little hoofs which project from the back of the foot in this animal. In the sheep, fig. 103, Plate 33, the amalgamation and suppression go still further; for here we find only one metacarpal bone and two toes, each covered by a hoof. In the horse, again, even the second toe is suppressed, and with the exception of the wrist, the whole limb is essentially composed of a single series of bones placed end to end. Thus, from the beautiful and delicate organization of the human hand, an organ capable of performing the most varied functions, down to the single toe of the horse, incased in a solid horny hoof, we find an uninterrupted series of steps, by tracing which we may see clearly how the great Designer, by merely modifying a single original plan, has produced creatures destined to play the most various parts in the grand economy of nature. And although we may attribute greater perfection to one form than to another, it must be remembered that such expressions are purely conventional, and that each creature, incomplete as the development of some of its parts may appear when compared with the same parts in other animals, is in reality as perfect, and as perfectly adapted to the purpose for which it was created, as any other; indeed, those very modifications of structure, which, at the first glance, would seem to be imperfections, are found, by careful study, to constitute beauties instead of blemishes in the great spectacle of nature.

We find the same structure, and the same modifications of structure, in the posterior as in the anterior limbs; but in these the mode of attachment to the rest of the skeleton is usually of far greater strength and solidity. The bones of the pelvis, which here take the place of the shoulder-blades and collar-bones, are immovably fixed to the sacrum; and, although in the embryo, and sometimes in the young mammal, there are three of these bones on each side, in the mature animal these are all completely united together; in most cases, also, the two sides of the pelvis are firmly united in the median line below, so as to form a strong but irregular ring of bone.

Near the middle of each side of this ring is the socket for the articulation of the thigh-bone or *femur*, H, which is usually a long, cylindrical bone with a nearly globular head, set on it almost at a right angle. Below this, at the knee-joint, are articulated the *tibia* and *fibula*, or shank-bones, J, K; and these are followed by the *tarsus*, L, including the heel, the *metatarsus*, M, and the phalanges of the toes, N. The correspondence of these bones with those of the anterior limb, will be at once seen by a glance at the figures of the skeletons, Plates 32, 33, 34; and these also show clearly that the modifications already described as occurring in the fore-leg, are accompanied by corresponding changes in the hinder extremities. The only mammals in which the hinder limbs are wanting are the Cetacea (whales, etc.), and in these the pelvis is represented by a pair of bones, united below in the form of the letter V, and suspended in the muscles below the sacrum, fig. 1 D.

The classification of the Mammalia still generally adopted, and the one which will be followed in the present work, is founded, with some important modifications, upon that of Cuvier, which in its turn was a great improvement upon the system proposed by Linnæus. The great Swedish naturalist divided the Mammalia into seven orders, distributed in three primary sections, called *unguiculata*, or clawed mammals; *ungulata*, or hoofed mammals; and *mutica*, or maimed mammals. The last section includes only the order CETE, formed by the whales and allied forms, in which as has already been stated, the hinder limbs are wanting. The hoofed mammals form two orders—the PECORA, or cattle, including the ruminating quadrupeds, and the BELLUÆ, those which do not chew the cud. Of the four orders of clawed mammals, the first or PRIMATES, distinguished by having two pectoral mammæ, and by certain characters of the teeth, includes the human species, the monkeys and their allies, and the bats; the second, BRUTA, in which the incisor teeth are wanting, is formed by the sloths, ant-eaters, and allied species; the third, FERÆ, includes the carnivorous mammals; and the fourth, GLIRES, those which, like the rat and the rabbit, have two chisel-like incisors in each jaw.

Cuvier, following the general arrangement of Linnæus, also adopts the same indications of a division of the class Mammalia into three primary groups. But in the Cuvierian system we find no order Primates; and the species of which this Linnæan group is composed are distributed into three orders. Man, as the highest type of organization, is placed in a distinct order, called BIMANA, or "two-handed;" the monkeys and their allies form a second order, that of the QUADRUMANA, "four-handed;" and the bats are associated with the greater part of the Linnæan *Feræ*, to form Cuvier's order of *Carnassiers* or CARNIVORA. Another portion of the *Feræ* of the great Swede were, however, separated by Cuvier, on account of certain singularities in their organization and mode of reproduction, to form the order of *Marsupiaux* or MARSUPIALIA, so called from the females having an abdominal pouch in which the young are protected for some time after their birth. Two other unguiculate orders are admitted by Cuvier. These are called *Rongeurs*, RODENTIA (gnawers), and *Edentés* or EDENTATA (toothless mammals), by the French naturalist, and correspond with the *Glires* and *Bruta* of Linnæus. Cuvier's two orders of hoofed quadrupeds, the *Pachydermes* or PACHYDERMATA, and the *Ruminants* or RUMINANTIA, correspond with the Linnæan groups *Belluæ* and *Pecora*, and both systems are closed by the whales, etc., which form Cuvier's order of *Cétacés* or CETACEA.

The most important new feature in Cuvier's classification of the Mammalia consists in the establishment of the order Marsupialia. These singular animals which, with the exception of the American opossums, are confined to Australia and the adjacent countries, are distinguished from the rest of the mammals by the very imperfect condition in which the young are born. In the ordinary mammals, when the embryo has attained a certain degree of development, a vascular body called the *placenta* is produced, by which the union of the young animal with the mother is greatly increased. This organ is never formed in the animals arranged by Cuvier in his order Marsupialia; their young are produced in an almost embryonic state, and the mother is usually furnished with an abdominal pouch containing the teats, which serves as a protection to the young animals during their helpless state. This character is referred to in the name given to the order, which is derived from the Latin *marsupium*, a pouch. In order to give the pouch a firmer support than it could derive from the abdominal muscles, the animals are furnished with a pair of peculiar bones (the *marsupial bones*), which spring from the anterior part of the pelvis; the presence of these bones constitutes one of the most important practical characters of the group, as they occur both in the males and females, and even in those species in which the pouch is deficient, or replaced by a mere fold of the skin of the belly.

Besides these characters, there are others of great importance presented by the structure of the brain, in which, as in their reproduction, the Marsupialia evidently exhibit a marked approach to the oviparous classes of Birds and Reptiles. In most of the Mammalia the two hemispheres of the brain are united, besides other bonds of union, by a large band called the *corpus callosum;* this is entirely wanting in the marsupials. The hemispheres themselves are smooth and smaller than in other mammals, leaving the olfactory and optic lobes and the cerebellum perfectly visible when the brain is viewed from above; characters which show a certain resemblance to those of birds.

Taking the whole of the above peculiarities into consideration, nearly all zoologists have not only coincided in admitting the justice of Cuvier's separation of the animal, presenting them as a distinct order of mammals, but have even gone beyond him, and regarded these creatures, with two singular animals referred by Cuvier to the Edentata, as forming a distinct *subclass* of mammalia, which has been denominated *Aplacentalia* or *Acotyledona*, from the absence of the placenta, the most striking physiological character exhibited by its members. Most naturalists, although regarding the characters presented by the aplacental mammals as indicative of a lower position in the scale of organization than that occupied by the rest of the class, have not failed to perceive that in the characters of the dentition, the limbs, and the general conformation of the body, they present a diversity almost as great as that manifested amongst the Placentalia, so that we find amongst them herbivorous, carnivorous, insectivorous, rodent, and even edentate forms; and thus arose the idea that the two subclasses of Mammalia were rather to be regarded as parallel and mutually representative series than as truly superior and inferior groups. This notion, carried still further, led some zoologists to ignore the section of aplacental mammals altogether, and to distribute its members amongst those orders and families of Mammalia with which, in their other characters, they seemed to be most nearly allied. As, however, these views were for the most part promulgated by writers who had some favourite theory of classification of their own to support, they naturally died with the systems which gave them birth, although it is remarkable that in one of the most recent and valuable works on the Mammalia,* we find the toothless aplacental mammals arranged with the Edentata as in the system of Cuvier, whilst the remainder of the subclass still stands as the order Marsupialia. Dr. Gray, of the British Museum, also places the toothless species with the true Edentata, whilst he follows Linnæus in placing the marsupials amongst the *Feræ*.†

The system that will be adopted in the present work is shown in the following tabular view:—

Subclass I.—PLACENTAL MAMMALS.

A. *Unguiculate or Clawed.*

Order 1. BIMANA; the anterior limbs furnished with hands.
" 2. QUADRUMANA; furnished with four hands; the posterior thumbs opposable.
" 3. CHEIROPTERA; anterior limbs converted into wings, the fingers being very long, and connected by a membrane.
" 4. INSECTIVORA; four feet formed for walking; molar teeth broad, with sharp tubercles.
" 5. CARNIVORA; four feet formed for walking; molars narrow and sharp.
" 6. PINNIPEDIA; four feet formed for swimming only; molars narrow and sharp.
" 7. RODENTIA; four feet formed for walking; no canine teeth; incisors two in each jaw, chisel-shaped.
" 8. EDENTATA; four feet formed for walking or climbing; no incisors or canines in either jaw.

B. *Ungulate or Hoofed.*

Order 9. RUMINANTIA; hoofs cloven; incisor teeth wanting in the upper jaw; stomach complicated.
" 10. SOLIDUNGULA; feet with a single toe and a solid hoof; incisor teeth in both jaws.
" 11. PACHYDERMATA; feet with two or more toes and hoofs; incisor teeth always in the upper jaw

C. *Mutilated or Defective.*

Order 12. CETACEA; body fish-like; anterior limbs converted into paddles, posterior limbs wanting.

Subclass II.—APLACENTAL MAMMALS.

Order 13. MARSUPIALIA; teats inclosed in a pouch, or between two folds of the skin of the belly; incisor and molar teeth always present; only one clavicle; external ears.
" 14. MONOTREMATA; with a single outlet or cloaca, for the urinary, generative, and intestinal organs; no pouch or external ears; teeth wanting or horny in texture; clavicle double.

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* Professor Wagner's Continuation of Schreber's *Säugthiere*.

† It must be remarked, however, that the few species of marsupial animals known to Linnæus were all of the ferine family of opossums.

We have not thought it necessary to indicate in the history of the classification of the Mammalia, the different steps by which Cuvier's arrangement has been modified so as to produce the fourteen orders shortly characterized above. These consist in the separation of the *Cheiroptera*, *Insectivora*, and *Pinnipedia*, from the *Carnassiers* of the great French zoologist; in the separation of the horses from the Pachydermata of Cuvier, to form the order *Solidungula*, and in the establishment of the order *Monotremata* for the edentulous aplacental mammals, placed by Cuvier and some other authors with the Edentata.

In concluding this portion of our subject we must devote a little space to the consideration of a new scheme of classification of the Mammalia lately put forward by the distinguished British comparative anatomist, Professor Owen. Starting from the assumption that the brain, as the centre of the nervous system, the most important of all the constituent elements of the animal body, must necessarily be modified in accordance with the habits, instincts, and powers of the various creatures, Professor Owen has taken the structure of this wonderful organ as the foundation of his system; and from the characters thus obtained he concludes that the two subclasses of placental and nonplacental mammals are not of equal value, and that it would be more proper to divide the class into four subclasses. Of these the first, which Professor Owen denominates the LYENCEPHALA, or "loosed-brained," are distinguished by the imperfect union of the two cerebral hemispheres, from the want of the *corpus callosum* already referred to; the hemispheres are smooth and small, exposing the olfactory and optic lobes and the cerebellum. This subclass corresponds with our *Aplacentalia*.

In a second subclass the hemispheres of the brain are united by a *corpus callosum*, but are not much larger than in the preceding, leaving the greater part of the olfactory lobes and the cerebellum exposed; their surface is slightly convoluted in a few of the largest species of the group, but in the majority they are smooth. From this circumstance Professor Owen proposes to call the animals of this subclass LISSENCEPHALA.

Those of the third group have the surface of the brain more or less convoluted, with but very few exceptions. Hence they are called GYRENCEPHALA. The cerebral hemispheres are much more largely developed in this than in the two preceding groups, and cover more or less of the cerebellum and olfactory lobes.

Lastly, in the highest subclass, the ARCHENCEPHALA, which includes only the human species, we find nearly the same cerebral characters as in the third group; but the hemispheres are much larger, forming the whole mass of the brain when viewed from above, and the convolutions are deeper and more numerous.

The animals belonging to each of these subclasses present certain anatomical peculiarities in common, which are carefully indicated by Professor Owen in his paper, and appear to lend considerable support to his views. The orders admitted by the learned professor are for the most part identical with those adopted in the present work; the differences in this respect and in the general arrangement will be easily seen from the following table:—

PROFESSOR OWEN'S CLASSIFICATION OF MAMMALIA.

SUBCLASSES.		ORDERS.
Archencephala,		BIMANA.
Gyrencephala,	Unguiculata,	QUADRUMANA. CARNIVORA.
	Ungulata,	ARTIODACTYLA. PERISSODACTYLA. PROBOSCIDIA. TOXODONTIA *(fossil)*.
	Mutilata,	SIRENIA. CETACEA.
Lissencephala,		BRUTA. CHEIROPTERA. INSECTIVORA. RODENTIA.
Lyencephala,		MARSUPIALIA. MONOTREMATA.

The Pinnipedia (seals) have vanished from the list to take their old place amongst the Carnivora, and the Solidungula no longer figure as a distinct order; but these losses are compensated by the division of the Cetacea into two orders, and by the establishment of the order Proboscidia for the elephants. The principal difference, besides these, between the classification proposed by Professor Owen and that adopted by the present writer consists in the mode of division of the rest of the hoofed quadrupeds. These, with Professor Owen, form the two orders *Artiodactyla* and *Perissodactyla*, or even-toed and odd-toed beasts—the former including the ruminants, the pigs, and the *Hippopotamus;* the latter the horses, the tapirs, the *Hyrax*, and the rhinoceroses. It seems to the author, however, that this mode of arrangement, the principal merit of which consists in its allowing the assignment of a definite place in the system to the remains of certain extinct species of Mammals, can hardly be regarded as natural when applied to those creatures, the whole of whose organization is known to us. The Ruminants appear to constitute a most natural and well-defined group, which cannot, taking the mass of their characters into consideration, be properly associated in the same order with any other forms of quadrupeds; so that the only course to be adopted would be that of establishing a separate order for the pigs and *Hippopotami*. This, however, does not appear to us to be necessary, and we shall therefore adhere in the present work to the old orders, *Ruminantia* and *Pachydermata*.

As regards the general arrangement or sequence of the orders and the establishment of the subclasses proposed by Professor Owen, no one can venture to give an opinion who has not thoroughly and patiently worked over nearly the same ground on the same principle of careful and conscientious investigation, in order, if possible, to obtain results which shall either confirm the views advanced by him, or show in what manner some fallacy may have crept into his generalizations. There can be no doubt that although this classification may not eventually be adopted as a whole, it must exercise an important influence on the views of succeeding zoologists; and we have therefore dwelt upon it here at considerable length, feeling that, although the requirements of a popular scientific work compel us to follow as closely as possible those opinions which are most generally entertained, the reader might fairly charge us with neglect if we omitted to place before him some account of a system which has justly acquired so much celebrity.

Order I.—BIMANA.

Although it cannot be denied that man, in his physical relations, is a member of the zoological series, and, as such, must occupy a place in our classification, it is not our intention, nor indeed is it compatible with the general scope of the present work, to enter at any length upon the consideration of the natural history of the human race. The study of this subject is far from being a purely zoological investigation. It includes a careful examination of the political history of mankind, from the earliest reliable records down to our own days, in order that the student may acquire some notion of the migrations performed by different races or varieties of men, and the consequent displacements and intermixtures that have taken place. The moral and intellectual qualities of the various races have also to be taken into consideration; and, of late years especially, the comparison of different languages, both as regards their verbal and grammatical accordance and diversity, has justly been regarded as affording a most valuable clue to guide the investigator in the labyrinth of tribes and nations. It is evident that a subject embracing such various investigations, and entering into the domain of zoology only by its physical aspect, cannot, with any propriety, be considered merely as a branch of zoological inquiry; and of late years the study of the natural history of man has been universally admitted to the rank of a distinct science, under the name of Ethnology, or the science of races.

If the reader will apply to himself the aphorism "Nosce te ipsum," the only character which Linnæus deigns to give of his *Homo sapiens*, although in a somewhat different sense from that in which it was intended by the Grecian sage, its author—he will find that he is in all points of structure a genuine and undoubted mammal; and the comparison of his organization with that of one of the higher apes, especially the chimpanzee, will leave him in little doubt as to the near approach which these animals make in some respects to the human race. This resemblance is so close in many particulars of structure, that we cannot coincide in opinion with those writers who hold that Man should on no account be admitted into the zoological series, an opinion founded principally upon the consideration of his intellectual faculties and moral qualities; nor can we even assent to Professor Owen's view, that the human race, regarded in its physical aspect, is so distinct in its characters from all other mammals, as to deserve to form a subclass by itself; but we are still further at variance with those writers who, like some modern French zoologists, have reverted to the Linnæan method, in so far as to revive the order of *Primates* for the reception of man and the monkeys—an intimate collocation of the human species with the lower animals which is exceedingly congenial to the views of those who hold the doctrine of the progressive development of species, or the gradual production of one species from another, by virtue of a law of development pervading all nature.

Independently of purely intellectual considerations, and of the comparative bulk of the brain which is connected therewith, and which of itself, with its concomitant effects upon the size of the skull and proportionately smaller development of the facial bones, would suffice to distinguish Man, even zoologically, from the rest of the Mammalia—we have to remark the perfect organization of every human being for an upright position, involving, as this does, great changes in all parts of the body. The foot is constructed so that the whole sole may be applied to the ground, forming with its arched instep a support at once firm and elastic. The bones of the shank and ankle are so arranged as to confer great firmness and a certain amount of mobility upon the foot; the knee is large and powerful, the thigh long and very muscular, and the pelvis large, strong, and changed in its position so as to allow the whole lower limb to be brought under the centre of gravity of the body. In all these respects we find a great difference between man and the apes, which, being adapted for passing their existence in trees, have the hinder limbs far shorter than in the human subject, the position of the pelvis different, and the articulations of the legs so arranged that the palms of their posterior hands are more or less turned inwards, or towards each other; hence, when an ape walks upright, he is rarely able to apply the whole sole of the foot to the ground, but waddles along upon the sides of his feet in an awkward and uncertain fashion, very different from the firm, elastic tread of man. As we advance upwards in our examination of the human body, we find the spinal column beautifully curved to adjust it to the upright position, and the skull supported nearly in equilibrium upon the first vertebra of the neck; the occipital condyles, or articulating processes, being placed almost exactly under the centre of gravity of the whole head. Thus, the maintenance of an upright position is facilitated in the human subject by every conceivable means, and the object of this modification is evidently to leave him at liberty to make full use of the beautiful and delicate mechanism which constitutes the hand of man. The monkeys, indeed, are all endowed with grasping hands, and in the majority these are even furnished with opposable thumbs; but these thumbs are much shorter than in the human hand, and the fingers are far from possessing the same amount of independent mobility as those of man. It is to this great perfection of his hand, together with the power which he possesses of making use of this organ, independently of the position of the other parts of the body, in other words, its complete removal from the system of locomotive organs, that man is mainly indebted for his capability of employing the intellect with which it is his proud prerogative to be endowed, and for his power of obtaining a mastery over all the rest of the animated creation. We cannot, in fact, imagine any modification of the human form which would render it a more fitting vehicle for the exercise of the mental powers possessed by man; nor can we conceive the performance of the various actions instigated by those powers by the instrumentality of any other known form of organization. Thus, then, from the general structure of the whole body, we obtain sufficient evidence of the title possessed by the human species to rank as a distinct order in our classification, to stand out clearly at the head of the animated world, and not merely as the highest member of the group of monkeys.

The principal physical characters by which man is distinguished at the first glance from all the other Mammalia are, therefore, as may be gathered from what we have already stated, his adaptation to an erect posture; the great perfection of his anterior members, and especially of his hands; the large size of his brain and skull; and the comparative smallness of the facial bones. Besides these we find other physical peculiarities which equally serve to characterize the order Bimana. Each jaw contains teeth of three kinds, namely, four incisors, two canines, and ten molars; and these are of nearly equal height, and arranged in a continuous series in each jaw, never exhibiting that diversity of size, or the gaps separating the canines from the incisors or molars, which occur in all other living mammals. The molars have their crowns uniformly enamelled, more or less cubical in form, and furnished with obtuse tubercles on the upper surface, a conformation indicative of the adaptation of the human species to a mixed diet. The skin is naked, or but sparingly clothed with hairs, except upon the head and some other parts of the body, and the nails are all flat and broad.

It is unnecessary to dwell upon the intellectual superiority enjoyed by the human race over the lower animals, as this must be sufficiently manifest to every one. The highest intelligence exhibited by an animal must be regarded as inferior to that of a child of two or three years old; and it is only the astonishment felt at witnessing the effects of education upon some of the most highly-endowed creatures, that often leads the superficial observer to attribute to them a higher degree of reasoning power than they really possess. It is, also, in the mind of man alone that has been implanted that belief in the existence of a Deity and in the immortality of his own soul, which is the foundation of all religious sentiment—a sentiment which, although often debased by the most degrading superstitions, seems to be inherent in the human race.

There is one other manifestation of the intellectual powers of man that must not be altogether passed over in silence, namely, the *faculty of speech*, or of producing and understanding articulate sounds. This appears to be peculiar to the human species; for, although there can be no doubt that in many animals there is some power of communicating intelligence from one individual to another, none of them possess a language. It is by means of this peculiar faculty that the progress of mankind is insured. It is by this that the knowledge acquired and the discoveries made in one age, or in one locality, are transmitted to later times or to distant countries; whilst by the reduction of language to written characters, the insecurity of oral tradition is got rid of, and the influence of every discovery is extended and made more permanent.

We come now to one of the most difficult subjects connected with the physical history of man—the question of the primitive unity or diversity of the human species; in other words, whether the original progenitors of the entire human population of the globe were perfectly identical in their essential characters, or whether the diversity which we now observe in different races be the result of a primary specific difference. There is no doubt that when we compare together the extreme varieties of humanity, as, for instance, Europeans, Negroes, American Indians, Chinese, and Australian savages, we may easily find in the form of the head and face, the colour of the skin, the nature of the hair and the general structure of the body, distinctive characters, such as in most cases of zoological investigation would lead us to regard these different forms as belonging to so many species. But this question, unfortunately, cannot be so easily settled; because, between these extremes of diversity we find so many intermediate steps, so many points where the physical characters of different marked varieties seem to be intimately blended, that it is often impossible to say to which of two supposed species a given tribe of men is to be referred.

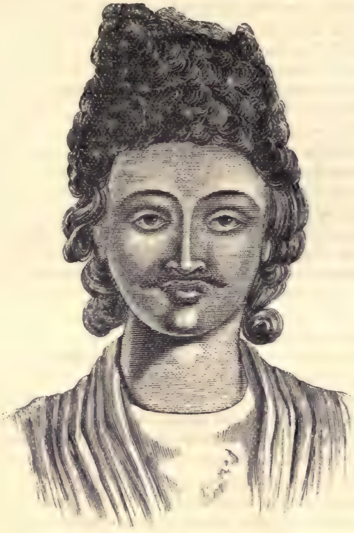
If we take the opposite supposition, namely, that all the varieties of man have been produced by the modification of a single species, or to put the matter more clearly, the progeny of a single pair, it is difficult to conceive that mere climatal influences and differences in the mode of life could have produced such immense changes, not only in the colour, but also in the conformation of different tribes. One of the strongest physical arguments adduced in favour of the unity of the human species consists in the continued fertility of mixed races, even where the grounds for the establishment of distinct species are apparently the strongest—as, for instance, in the progeny of Europeans and Negroes. But this argument is fallacious, as, although the majority of animal hybrids may be sterile, there are undoubtedly cases in which this rule is departed from; indeed, it is not improbable that some of our most valuable domestic animals are hybrids. The test of colour, which is often relied upon as an indication of variation distinctly referable to a recognizable cause, namely, the influence of a greater or less degree of heat, does not always apply; for although we may state as a general rule, that the inhabitants of hot plains are darker than those of colder or more mountainous regions, yet there are many important instances that may be adduced in opposition to the universal application of this rule: the most northern tribes are usually of dark complexions, and the natives of Australia and Van Diemen's Land are darker than many tropical nations. The varieties of domestic animals, which are so numerous and often so remarkable, have been produced, for the most part, by the artificial variation of the conditions of their existence; and where they are due to climatal influences, it must be borne in mind that the creatures have been in a manner forcibly transplanted to their new abodes, which they would, in all probability, never have reached but by the instrumentality of man. With the human subject the case is different; his organization adapts him for existence in all parts of the world where he can find the necessary supplies of food: with this restriction, no region is too hot or too cold for him, and this does not merely apply to the indigenous races of each district, for the individuals of most races can live and thrive in the districts originally belonging to other tribes; and in this case, as far as we know, the posterity of the new comers retains the characters of its original progenitors. This is remarkably shown in the present day in the United States of America, where the native American, the European, and the Negro, have now lived and propagated under the same conditions of climate for many years, without losing their original characters. Thus the difficulties are nearly equally great on both sides, and we only partially get rid of them by assuming that a multiplicity of individuals of the human species may have been originally created, and that the gradual intensification of the personal characteristics of these individuals in their descendants by constant intermarriage within the same families, may have given rise to the varieties which are now met with. Otherwise, if production from a single original pair be necessary for the establishment of the unity of the human species, we are forced to admit for it a much greater antiquity of origin than is usually supposed; for we know from ancient Egyptian pictures that, in the Mosaic period, the physical characteristics of the Hebrews, Copts, and Negroes were as strongly marked as in the present day; and it is impossible to suppose that such important modifications of one and the same type would have been produced by climatal influences in the period intervening in our chronology between the epochs of Noah and Moses, and that in the present day we should find different races still retaining their essential characteristics, after dwelling together for many ages in the same region. Moreover, not to mention the chronologies of the Chinese and Brahmins, which appear to run into the opposite extreme to our own, we may refer to the statement of Professor Lepsius, that the chronology of the Egyptians may be traced up to the year 3900 B.C., and that the fourth dynasty, including the builders of the chief pyramids, commenced in the year 3430 B.C. He adds that "a thousand years at least, and probably still more, must be conjectured for the gradual growth of a civilization which had been completed, and had in part begun to degenerate at least 3430 years before our era."—(See Lepsius in Humboldt's *Cosmos*, vol. ii.) Mr. Leonard Horner, also, in his boring through the sediment of the Nile at Memphis, found a fragment of pottery at a depth of thirty-nine feet from the surface; and as it appears from unquestionable data that, during the last 3215 years, the average amount of sediment deposited has been three and a half inches in a century, this fragment is regarded by Mr. Horner as a proof of the existence of man more than 13,370 years ago—"of man, moreover, in a state of civilization, so far, at least, as to be able to fashion clay into vessels, and to know how to harden them by the action of a strong heat."—(*Proceedings of Royal Society:* 1858.) Perhaps the most probable conclusion at which we can arrive from the consideration of all this evidence is, that the whole human population of the globe belongs to a single species, modified by climatal and other influences, extending over a period of years so long that our authentic historical data relate only to a small portion of it.

As might be expected from the short reference already made to the innumerable shades of difference presented by different tribes of mankind, and the insensible blending of the one into the other, the discrimination of the principal varieties of the human species is by no means an easy task; and we accordingly find that nearly every writer on this intricate subject entertains peculiar views as to the affinities of particular tribes, or even as to the number of primary varieties which it is necessary to admit. Thus, Cuvier refers all the varied forms of mankind to three, Blumenbach to five, Pritchard to seven, and Pickering and Latham to eleven leading varieties. It is principally by the consideration of the structure of the languages that the number of varieties has been so greatly increased by the last-named writers. In their chief physical characters most of the tribes of mankind may be conveniently referred to the five sections proposed by Blumenbach. These are the *Caucasian* or *Iranian*, the *Mongolian* or *Turanian*, the *Malayan*, the *Ethiopian*, and the *American* varieties.

1. CAUCASIANS or IRANIANS.—This variety includes all those nations which have made the greatest progress in civilization. Their colour depends principally upon the country inhabited by them, the skin in those dwelling in temperate zones being white, more or less tinged with pink in different parts by the blood shining through it; whilst in the nations of warmer climates the colour gradually becomes darker, and finally almost black. The hair exhibits similar, and, to a certain extent, corresponding variations in colour; in temperate climates it presents every shade from red and yellowish-brown to black, whilst in the darker races of hot countries the last-named colour predominates; but in all cases the hair is straight or simply curled, but never crisp and woolly in appearance. The face is oval, and the forehead high, the facial angle approaching a right angle; the eyes are straight; the nose is usually narrow and prominent, and the lips are moderately full. The great Caucasian variety extends from Hindostan through Persia and the Caucasus to Europe, of which the greater part of the inhabitants belong to it; it also includes the nations inhabiting Arabia, Syria, and the northern and north-eastern parts of Africa. The latter,

amongst which we may notice the Arabs, the Jews, the Moors and the Abyssinians, constitute a great subvariety, distinguished by certain peculiarities, especially of language; they are called the *Semitic*, *Aramæan* or *Syro-Arabic* races. They are considered by Dr. Latham to form part of the great African variety.

Fig. 1.

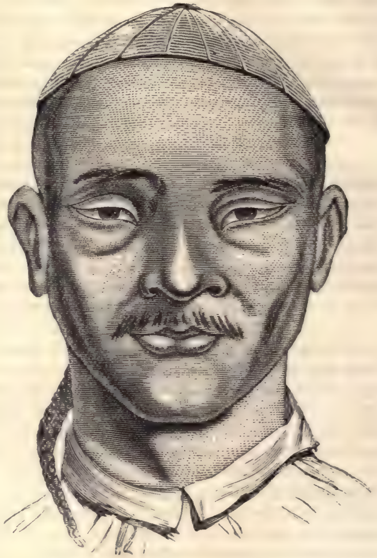


Circassian.

The remainder of the Caucasian races principally belong to a second great stock—that of the *Indo-Europeans*, including the Hindoos, Persians, and all the European tribes, with the exception of the Magyars of Hungary, the Laplanders, Fins, and other Mongolian tribes of the extreme north, and the Basques of Spain, the remains of the ancient Iberians, whose affinities are not yet clearly ascertained. These tribes all speak languages which are considered to be derived from the Sanscrit. The true Caucasian tribes, such as the Circassians and Georgians, are distinguished from the rest by peculiarities of language, which would seem to indicate an affinity with the following variety, whilst the appearance of the people, and especially the conformation of the skull, caused Blumenbach to regard them as the type of the white races.

2. MONGOLIANS OR TURANIANS.—In these races the colour of the skin also varies from the clear white complexion of the fairest Europeans, through various shades of olive, tawny, or even yellow, to a dark yellowish-brown. The skull is rounder than in the European races; the face is broad and flat, with very prominent cheek-bones; the eyes are narrow and small, with the outer angle drawn upwards, so that the direction of the opening of the eyelids is oblique; the nose is small and broad, and the lips usually thin. The Mongolian races are distributed over the whole of northern and eastern Asia, thus including the highly cultivated Chinese, Japanese, and Siamese, the nomadic tribes which wander over the boundless plains of Central Asia, the Tibetans, the savage hill-tribes of northern Hindostan and the Turcomans of Western Asia. The latter are the original stock of the Turks, who have established their rule upon the ruins of the Greek empire. It is to movements in the vast Mongolian populations of Northern and Central Asia, propagated even from the confines of China, that we are to ascribe those devastating invasions of barbarians which ultimately destroyed the western Roman empire. Even in Europe, the remains of these conquering hordes are still to be found in the Magyars of Hungary, who only obtained a footing in their present domicile in the tenth century of our era. The inhabitants of Lapland and Finland also, with those of the provinces of Livonia and Esthonia, south of the Baltic, and of a large extent of country in the north and east of European Russia, belong to a Mongolian stock, some of them being probably the aboriginal inhabitants of the districts which they at present occupy; whilst others have established themselves where we now find them, by displacing other tribes, either of Mongolian or of Caucasian descent. At the north-eastern extremity of the Asiatic

Fig. 2.

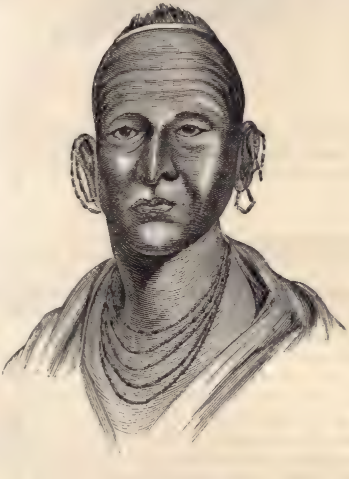


Chinese.

continent we find the coast occupied by the *Esquimaux* or Eskimo, as they are now frequently termed, which are also regarded as belonging to the great Mongolian variety. These people are remarkable from the fact of their extending from the Asiatic station just mentioned, through the Aleutian Islands to the continent of North America, all the Arctic shores of which, including those of Greenland and Labrador, are peopled by Esquimaux tribes. It is by their means, therefore, that the ethnological connection between the old and new continents has been established; and it seems not improbable that, in the lapse of ages, all the varied tribes of American Indians may have been derived from Esquimaux progenitors. These tribes are, however, considered to form a distinct variety of the human species.

3. AMERICANS.—The skin in these races is usually of a reddish clay colour, sometimes copper colour, but becoming brown or blackish in the hot tropical plains. The hair is long, straight, and usually coarse; the eyes are generally small, but not narrow and oblique as in the Mongolians; and the nose is large, high, and often well formed. The forehead is retreating, and the cheekbones prominent. In its geographical distribution the American variety presents a remarkable peculiarity. The other races appear to be more or less limited in their natural extension by degrees of latitude, that is to say, their tribes spread for the most part in an east and west direction, so as to preserve, within certain limits, a similarity of climate. The American man, on the contrary, has spread in the opposite direction, or from north to south, so that nearly from the Arctic circle to the southern extremity of Patagonia, over a space of about one hundred degrees of latitude, the aborigines of America all belong to the same stock and exhibit striking characters of resemblance, both in their physical conformation and in the structure of their languages. They are for the most part in an uncivilized condition, although, as is well known, the Mexicans and Peruvians had attained to a high state of cultivation before the discovery of the New World.

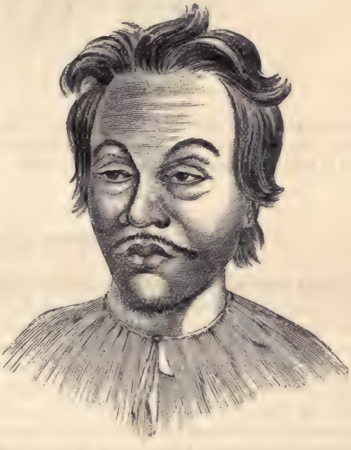
Fig. 3.



American Indian.

4. MALAYANS.—The Malayan races, which are also called *Oceanic* by Dr. Latham, are usually of a yellowish-brown complexion, but their colour varies in intensity from a light brownish yellow to nearly black. Their hair is always black, usually straight, but frequently more or less curled; they have generally a high forehead; narrow, but not oblique eyes; and a broad but not flattened nose. In the general physiognomy we often find an approach to the Mongolian races, some of which are, in fact, the nearest neighbours of the Malayans; but in some instances the expression of the face, and even the nature of the hair, present so much similarity to the Negroes, that the populations thus characterized have occasionally been referred to the negro type. The Malayan races include the inhabitants of the peninsula of Malacca, and of the eastern Archipelago, together with those of the Pacific Islands, New Guinea, Australia, and New Zealand. The natives of Madagascar are also Malayans. In the Negritos of Sumatra, Mindanao, and the New Hebrides, the negro characters make their appearance in a remarkable manner, as also in the Papuas of New Guinea and some of the neighbouring islands, in which the hair is of great length and strongly frizzled, standing out from the head on all sides, so as to present the appearance of an enormous wig.

Fig. 4.



Malay.

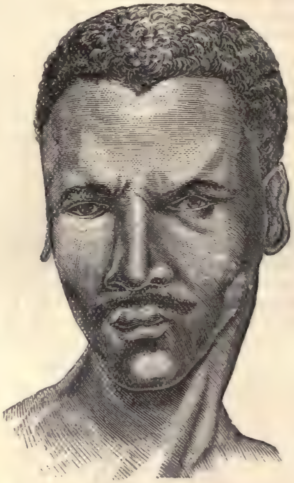
5. ETHIOPIANS.—The races commonly, but incorrectly, called Ethiopians, have the skin of various dark

tints, from deep brown to a nearly perfect black, and the hair short and woolly in its appearance. The forehead is depressed and the jaws prominent, in some cases so much so as almost to form a muzzle; the face is flat, with the cheek-bones not very prominent; the nose is broad and flat; and the lips very thick. The Ethiopian variety includes all the races of Africa, from the southern and western boundaries of the Semitic nations (Moors, Arabs, and Abyssinians) to the Cape of Good Hope. The principal races are the true Negroes of Central Africa, the Caffres and Hottentots; the Bushmen appear to be a degraded tribe of the latter.

Fig. 5.

Negro.

Fig. 6.



Caffre.

ORDER II.—QUADRUMANA.

THE most essential character of this order is expressed in its name; the animals composing it are furnished with four grasping hands, and in the majority of them these are all provided with opposable thumbs. In some, however, the anterior extremities are altogether deprived of thumbs, so that the posterior feet alone are deserving of the title of hands; and this presence of true hands on the hinder extremities, constitutes the most constant character by which the Quadrumana are distinguished from the rest of the placental Mammalia. It occurs again in the non-placental opossums, and from this circumstance, some naturalists have thought fit to form a single group under the name of Pedimana, or Foot-handed animals, for the reception of the Quadrumana and opossums. The only exception to the character here given, presented by any animal which we refer to this group, is that exhibited by the *Galeopithecus*, or Flying Lemur, a creature which seems to unite the Quadrumana with the Cheiroptera or Bats, having been placed, by different zoologists, sometimes in one and sometimes in the other of these orders. In this there are no opposable thumbs either on the anterior or posterior extremities. From the peculiar characters presented by the *Galeopithecus*, some zoologists, including Professor Van der Hoeven, have even regarded it as entitled to form a distinct order.

The principal distinctions between the Quadrumana and the Bimana have already been indicated under the latter head; we shall, therefore, confine ourselves here to a general statement of the characters of the present order. The conversion of the hind feet into hands, and the accompanying modifications of the general structure of the hinder extremities, which, as we have already seen, prevent even the highest apes from easily maintaining the erect attitude natural to man, adapt the Quadrumana most admirably for their mode of life, which is, in most cases, strictly arboreal; and as those species which are not inhabitants of the forest, are dwellers amongst the rocks, the advantage, even to them, of their hinder hands will hardly be denied by the most experienced cragsman. Amongst the branches of the trees, the apes and monkeys disport themselves with an agility and security astonishing to the spectator, and the great African baboons are described as scrambling up the faces of nearly perpendicular rocks with the greatest ease.

In the general form of the body we find a great diversity in this order. The apes and monkeys present a greater or less resemblance to the human species; the baboons are more quadruped in their appearance; and the lemurs resemble ordinary quadrupeds in their form. The development of the tail, also, is very variable; some, such as the apes, being perfectly destitute of this appendage, which is also rudimentary in several of the baboons, whilst the majority of the monkeys and lemurs are well provided with tails, and these in the American monkeys are often prehensile, thus furnishing these creatures as it were with a fifth hand, which is of great service to them in their arboreal gambols.

The resemblance in the form of the brain and skull in the apes to that of the same parts in the human species, is greatest in the young animals, and it is owing to this, and to the fact that most of the specimens of the larger apes brought to Europe have been very young, that we are to attribute the exaggerated notions frequently entertained with regard to the extent of this similarity. In the young animals the brain is larger even in proportion to the rest of the body than in full-grown specimens; and as long as the dentition is confined to the milk teeth, the jaws are but little produced, so that the forehead is high, and the facial angle very large; but as the first teeth are shed and the permanent ones produced, the space required for their accommodation becomes greatly increased, and the jaws are necessarily prolonged, whilst no corresponding change takes place in the dimensions of the cranium, and thus the face eventually acquires the form of a prominent muzzle. In the change of teeth, the canines acquire a great development, crossing each other, and interlocking like those of a carnivorous animal, so that the jaws of an adult ape or baboon present an aspect almost as formidable as those of one of the larger cats; and as a consequence of this great size of the canines, gaps are left between these teeth and the incisors or molars, to permit the lodgment of the canines of one jaw by the side of those of the other. The molars, in form, greatly resemble those of the human subject.

The remaining general characters of the order may be dismissed in a few words. Except in the genus *Galeopithecus*, already alluded to, the orbits, or bony sockets of the eyes, are completely closed, as in man. The external ears are usually small, but variable in form, sometimes resembling those of the human species, sometimes erect, as in the cat. The fingers are generally furnished with flat nails, but some species have curved, compressed claws, either on the whole or on some of the fingers. The mammæ are almost always placed on the breast, and two in number; in the *Galeopithecus*, there are four pectoral teats; and in the *Cheiromys*, a doubtful species of the order, these organs are situated on the hinder part of the abdomen.

In their geographical distribution upon the face of the earth, the Quadrumana must be regarded as a tropical group. They are found in the forests and rocky deserts of Southern Asia, of Africa, and of South America, where they live in troops, and feed principally upon fruits, often descending to plunder the gardens and fields of the inhabitants. In Africa, the range of the baboons extends as far south as the Cape of Good Hope; whilst a species of baboon-like monkey, the well-known Barbary ape, not only occurs on the southern shores of the Mediterranean, but even crosses to the European coast, and lives in numerous troops upon the rock of Gibraltar.

This is at present the most northern range of any species of the order Quadrumana; but the fossil remains of these animals found in some European tertiary formations prove, that at a former period of the earth's history several species of monkeys and apes lived upon the continent of Europe, and even in England. In some fresh-water sands at Kyson in Suffolk, the tooth and part of the jaw of a *Macacus*, a monkey allied to the Barbary ape, have been found; these strata belong to the eocene, or earliest tertiary formations. In the miocene, or middle tertiary fresh-water strata, at Sansan in the south of France, M. Lartet in 1837 discovered the first known fossil remains of a quadrumanous animal, considered to be allied to the Gibbons, which are now confined to the islands of the Eastern Archipelago; and in 1856 that geologist also found in the same region, the lower jaw and humerus of a gigantic ape, larger than any known living or fossil species, and presenting, in some respects, a nearer approach to the human species than even the chimpanzee. Other fossil species of monkeys have been found in the south of Europe at Montpellier and near Athens, both belonging to the Indian genus *Semnopithecus*. In the Sivalik hills of Northern India, the remains of several species of monkeys have been discovered by Messrs. Falconer and Cautley, and there is no doubt that as the geological investigation of the warmer regions of the Old World advances, other forms of Quadrumana will be found. The fossil monkeys which have been discovered in some caves in Brazil, belong to the same group as those now inhabiting the South American continent; these are considered to have lived in the pliocene, or latest tertiary period; and it is interesting to find that in this, as in some other cases, there was then the same difference in the type of the mammalian inhabitants of the two hemispheres, as at the present day.

When we examine the various animals belonging to this order, we find that the greater portion of them may be included in two sections—the Monkeys (*Simiæ*) and the Lemurs (*Prosimiæ*). In the former, the incisors are always four in number in each jaw, and the rest of the dentition presents a certain resemblance to that of man; the nails of the fingers are similar, either flattened or claw-like, and those of the thumbs always flat. In the lemurs the number of incisors is variable; and the first finger of the hinder hands is always furnished with a curved, compressed claw. In both these groups the hinder thumb is opposable, and this is also the case with the thumb of the anterior extremities, except in those cases in which it is rudimentary or altogether wanting. There are other points of relationship between these two sections, which may consequently be regarded as forming the true Quadrumana; but, besides these, we have to dispose of two other groups, each including only a single family, and but one or two species, the characters of which are such as to render the justice of placing them in the present order almost a matter of doubt. These aberrant forms are the *Cheiromys* and the *Galeopithecus* already alluded to.

Commencing with the *Simiæ* or Monkeys, as undoubtedly the highest group of animals, and including the species which approach most closely to man, we find that these also present certain characters, agreeing most remarkably with the geographical distribution of the creatures, by which they may be divided into two sections. The monkeys of the Eastern hemisphere have the nostrils placed close together, and separated only by a narrow septum or partition; the American monkeys, on the contrary, have the nostrils placed wide apart on the sides of the nose, which is broad and flat. Hence the former are called *Catarrhine*, and the latter *Platyrrhine* monkeys.

FAMILY I.—SIMIADÆ.

The Catarrhine monkeys, or monkeys of the Old World, constitute only a single great family, that of the Simiadæ, the genera of which this is composed resembling each other so closely in their most essential peculiarities, and often melting into each other by such imperceptible gradations in their minor characters, that not only is any further subdivision of them into accurately-defined subordinate groups almost impossible, but it is sometimes difficult even to separate the genera themselves by well-marked peculiarities of structure.

All the Simiadæ bear the same number of teeth as the human species, namely, four incisors, two canines, and ten molars and premolars in each jaw, making a total of thirty-two; they also agree with man in the general form and arrangement of the teeth, except that the incisors are more oblique than in any variety of the human race, and there is always a vacant space in the vicinity of the canines. The tubercles of the molar teeth are obtuse. The tail is sometimes altogether deficient, and when present it varies greatly in length, being sometimes a mere tubercle, whilst in other cases it is longer than the body; but it is never prehensile at the tip. Naked raised patches or callosities occur on the buttocks of nearly all the species; these are formed by a thickening of the epidermis supported upon a peculiar process of the ischium, and constitute a sort of natural cushion upon which the animals sit when taking their repose. In most cases, also, these monkeys are provided with cheek-pouches in which they stow away a supply of food for future consumption.

Taking the general characters of these animals into consideration, we may distinguish among them three principal groups—those of the *Apes*, *Monkeys*, and *Baboons*. In the first of these groups, or the true apes, the tail and cheek-pouches are entirely deficient, and the buttocks are either destitute of callosities or have them very small. It is amongst these apes that we find the species most nearly approaching man in their organization; and hence these animals are called *Anthropoid* or *Anthropomorphous* (Manlike) Apes, by most naturalists. Of the species at present known, the one which undoubtedly presents the greatest amount of resemblance to man is

THE CHIMPANZEE (*Troglodytes niger*).—By all authors, with the exception of Cuvier, and one or two who adopted the opinion of that great naturalist, the chimpanzee has been regarded as the highest species of the apes; and the character upon which Cuvier founded his preference for the orang-outan has been shown by later researches to be fallacious. Cuvier states that the volume of the brain and the prominence of the forehead is greater in the orang-outan than in the chimpanzee; and later writers, following Cuvier, have defined the supposed difference in this respect by means of the facial angle, saying that in the orang this angle is 65°, whilst in the chimpanzee it is only 50°. This, however, is due to the comparison only of animals of different ages, the forehead being far more prominent in the young animal than in older individuals of both species, from the projection of the muzzle increasing as the creature approaches maturity; so that, if adult specimens of the chimpanzee and orang-outan be compared together, the difference will be found to be very small, and, if anything, rather in favour of the chimpanzee. The limbs in the chimpanzee, also, more nearly resemble those of man in structure; the arms are not much longer than in the human species, whilst the legs considerably exceed those of the orang in development, both as regards their comparative length, their muscularity, and their capability of supporting the animal in an erect posture. Both in the chimpanzee and the gorilla, the two species of the genus *Troglodytes*, the number of ribs is thirteen, whilst the orang-outan has twelve ribs like the human subject.

The adult chimpanzee measures nearly five feet in height when standing erect. Its body is covered with long, coarse, black or blackish-brown hair, which is very thick upon the back, but clothes the breast, belly, and limbs more sparingly; at the sides of the head and face the hair is very long, and hangs down in the form of whiskers; the face and ears are nearly naked, and of a brownish flesh colour; the ears nearly resemble those of the human species in form, but are very large; the eyes are rather small, and the lips thick. The hands and feet are nearly naked, and the hairs of the fore-arm are directed towards the elbow, where they meet those of the upper arm, and usually project in a point.

The chimpanzee is a native of the vast forests of the west coast of Africa, extending from the river Gambia, north of Guinea, as far as the district of Benguela, or over a space of about thirty degrees of latitude. It lives among the trees, usually avoiding the neighbourhood of man, but forming little huts with branches of trees for its protection from the weather, at an elevation of thirty or forty feet from the ground. Its food consists principally of fruits, and it is also fond of the succulent terminal bud of the cabbage palm, which is likewise a favourite article of human food in tropical regions. In the trees the chimpanzees are very active, and display astonishing strength and agility in their movements; the adult males especially are exceedingly powerful, and from their being armed with large canine teeth are very formidable animals. The chimpanzees are described by several travellers as arming themselves with clubs, with which they attack and often kill the negroes whom they meet with in the woods; and they are even said to assault the elephants with the same weapons, and drive them out of their districts. These statements, if true, probably relate to the gorilla, as even the adult male chimpanzee is said to fly from a man. In their sexual habits they are described as being very disgusting; and, according to Dr. Savage (an American missionary to whom we are indebted for the actual discovery of a second species of *Troglodytes*), the Negroes have a tradition that the chimpanzees once belonged to the human race, but that they were expelled from society on account of the incorrigible depravity of their habits.

The chimpanzee does not appear to have been clearly known to the ancients, and yet in a very old Carthaginian voyage, the *Periplus* of Hanno, we have a curious account of an animal which can only be referred to this or the following species. At least five hundred years before our era the Carthaginians appointed Hanno, one of their admirals, to sail with a large fleet through the Straits of Gibraltar, for the purpose of founding Carthaginian colonies along the African coast. According to the journal of this voyage, which has come down to us, the admiral set sail with no less than thirty thousand colonists of both sexes, and coasting along the western shores of Africa, succeeded in establishing numerous colonies at different places. He describes the coast and its inhabitants, and evidently entered the Gulf of Guinea, in which he sailed until he reached a bay called by his interpreters the *Southern Horn*. "In the bottom of this bay," says the Carthaginian admiral, "there was an island similar to the one previously described (in his voyage); this contained a lake, and in this lake there was another island inhabited by wild men. The women were most numerous; they were entirely covered with hair, and our interpreters called them *Gorilloi*. We pursued them, but could not capture the men; they all escaped us by their great activity, as they climbed the rocks and defended themselves by throwing stones at us. We only caught three women, who resisted by biting and scratching their conductors, and we were forced to kill them. We skinned them, and brought back their skins to Carthage." These skins were placed in the temple of Astarte in Carthage, where they remained until the taking of that city in the year 146 B.C., as stated by Pliny, who, however, only mentions two of them, and changes the name of these wild men into *Gorgones*. The *Gorilloi* of Hanno, the Troglodytes, Satyrs, and other fantastic creatures described by the ancient naturalists, were regarded by them as monstrous varieties of the human race, and the idea of their existence was probably derived from the imperfect accounts given by travellers of the Anthropoid apes. These notions continued to prevail throughout the middle ages, and it was not until a very recent period that they were replaced by more correct views. Thus, even Linnæus describes a *Homo Troglodytes*, as a second species of man, in which he evidently confuses together the older narratives relating to both the chimpanzee and orang-outan; just as, in his genus *Simia*, he combines these two species under the common name of *S. Satyrus*.

It was not until the latter part of the sixteenth century, when the intercourse of Europeans with the west coast of Africa became more extended, that the accounts of travellers began to furnish more reliable information upon these large apes, although the earlier of these accounts are for the most part mixed up with fabulous narratives obtained from the Negroes. Andrew Battel, an English sailor, who was taken prisoner by the Portuguese in 1589, and resided for several years in Angola, mentions "two kinds of monsters," as he calls them, which inhabit the woods of that country; of these the largest, which, he says, is of gigantic height, is called *Pongo*, and the other *Enjocko*, by the natives. The former is most probably identical with the newly-discovered gorilla; the enjocko of Battel is, no doubt, the same as our chimpanzee; and we find from later sources that in the district of the Gaboon, the Negroes give the name of *N'Tschégo* to the chimpanzee. De Laval, a Frenchman, who published his travels in 1619, mentions the occurrence of these animals in Sierra Leone, where he says they are called *Barris*, and adds that they may be trained "to perform all the duties of a household servant." He states that they "generally walk upright, upon the hind feet only; they will pound grain or any other substance in a mortar, go to the well, fill their water-jars and carry them home on their heads; but if some person be not at hand to relieve them from their burden on their arrival, they let the jar fall, and begin to cry on seeing it broken." Jobson also describes an ape of five feet in height, called by the Negroes *Quoja Vorau*, which, according to him, can be taught to fetch water and to perform other household offices. De la Brosse, in his "Voyage to the Coast of Angola," published in 1738, refers to the species under the name of *Quimpezé*, but seems to have mixed up the chimpanzee and the gorilla, for he describes the animals as attaining a height of six or seven feet. He confirms many of the facts narrated by preceding travellers, and makes especial mention of the abduction of Negresses by these creatures, a habit which is so commonly ascribed both to the large apes and the baboons, stating that he was acquainted with a woman at Loango who lived three years amongst these animals. This account of the predilection of the chimpanzees for human concubines is confirmed, from hearsay, by Smith, who visited the coast of Guinea in 1744, and who says the animal is there called *Mandrill;* in fact, it appears that the name of *Drill*, commonly applied to one of the large baboons, really belongs to the chimpanzee, and that it is the root of the Greek word *Gorilloi*, given by Hanno as the name of his wild men. These narratives, with the exception of Battel's, probably refer both to the pongo and the enjocko of the latter.

The first specimen of the chimpanzee seen in Europe was a young living individual, which was brought to Holland towards the end of the seventeenth century. This specimen, which was from Angola, was described by Tulpius, who, however, confounded it with the orang-outan, in which, as already stated, he was followed by Linnæus. Buffon, also, who had the opportunity of examining at least one living specimen of the chimpanzee, did not recognize its distinctness from the orang. It was first described under the name of *Simia*

Troglodytes by Blumenbach; and M. Geoffroy Saint-Hilaire regarded it as the type of the distinct genus *Troglodytes*, in which he has been followed by most subsequent zoologists. The anatomical structure of the chimpanzee was well described as long ago as the year 1699, by an English anatomist, Tyson, in his "Anatomy of a Pigmy," where he enters into a detailed exposition of the characters in which this animal resembles and differs from man.

The individuals which have been brought alive to Europe and exhibited in our menageries, have all been young animals, usually about two years old, and between two and three feet in height; they can, consequently, give us but little idea of the habits and disposition of the adult chimpanzee. They have all exhibited a striking amount of intelligence, and a gentleness and docility such as we hardly associate with the idea of a monkey. The individual observed by Tyson in 1699, is described by him as a gentle, affectionate, and harmless creature, which became much attached to the sailors on board the ship in which it was brought to England, embracing them with the greatest tenderness, opening the breasts of their shirts, and clasping its arms around them. It showed a great aversion to some small monkeys which were brought home in the same ship, keeping at a distance from them, as if it considered itself a being of a superior order. It became fond of wearing clothes, would dress itself partly, and apply for assistance in any difficulty to some of the crew or passengers.

The celebrated French naturalist, Buffon, has given the following interesting account of the chimpanzee observed by him, which he calls the *Jocko*, but confounds with the orang-outan. He says—"Its air was melancholy, its deportment grave, its movements measured, its disposition gentle, and very different from that of the other monkeys; it had none of the impatience of the magot (Barbary ape), the ferocity of the baboon, or the extravagance of the monkeys. It may be said that it had been well taught; but the others had also received their education; a sign or a word was sufficient for our orang-outan; whilst the baboon required the stick, and the others the whip, as they only obeyed under the fear of chastisement. I have seen this animal present its hand to lead out its visitors, or walk about with them gravely as if it belonged to the company. I have seen it seat itself at table, unfold its napkin and wipe its lips, use its spoon and fork to carry its food to its mouth, pour its drink into a glass, and touch glasses when invited; fetch a cup and saucer to the table, put in sugar, pour out its tea and leave it to cool before drinking it; and all this without any other instigation than the signs or words of its master, and often of its own accord. It was perfectly harmless; it even approached one with a certain respect, and presented itself as if to ask for caresses. It was excessively fond of sugar-plums, . . . but ate almost anything, although it preferred ripe and dry fruit to all other aliments; it drank wine, but in small quantity, and left it willingly for milk, tea, or other mild beverages."

This description is interesting, as showing the amount of education of which the chimpanzee is susceptible; but, perhaps, the most striking example of the intelligence of this ape is recorded by the French traveller, De la Brosse, whose "Voyage to Angola" has been already referred to. One of two young chimpanzees purchased by this traveller, was taken ill on board ship. "He gave himself all the airs, and demanded the same care as a human being; he was even bled twice in the right arm; and afterwards, whenever he felt indisposed, he would hold out his arm to be bled, as if conscious that it had done him good."

Subsequent observations of other specimens in confinement have not only confirmed the idea of the great intelligence and gentleness of the chimpanzee conveyed by the preceding extracts, but have also thrown more light upon the natural habits of the species, and enabled recent zoologists to correct some errors into which their predecessors had fallen. Thus Buffon, writing from recollection, states that his Jocko "always walked upright on its hind feet, even when carrying heavy loads." The individuals since observed have shown that if this was the case, it must have been a result of education. The chimpanzee, certainly, appears to have a greater power of sustaining itself in a nearly erect posture than the other apes; but in its natural mode of progression it exactly resembles the latter, its body being inclined forward in walking, and supported upon the anterior limbs, of which the knuckles are applied to the ground.

THE GORILLA (*Troglodytes Gorilla*), Plate 1, fig. 1.—We have already, in treating of the chimpanzee, indicated that, from the narratives of the older travellers there has always been reason to believe that two large species of apes lived on the west coast of Africa. The curious recital of Hanno, already quoted (see page 17), may indeed apply to either species; but as early as the close of the sixteenth century, we have seen that Andrew Battel clearly indicates "two kinds of monsters" as inhabiting the woods of Angola: one of these is the chimpanzee; the other, he says, "is called *Pongo* in their language." Of the latter he states, that "the pongo is in all his proportions like a man (except the legs, which have no calves), but he is of gigantic height. The face, hands, and ears of these animals are without hair; their bodies are covered, but not very thickly, with hair of a dunnish colour. When they walk on the ground, it is upright, with the hands on the nape of the neck. They sleep on trees, and make a covering to shelter them from the rain. They eat no flesh, but feed on nuts and other fruit; nor have they any understanding beyond instinct. When the people of the country travel through the woods they make fires in the night, and in the morning when they are gone the pongos will come and sit round it till it goes out; for they do not possess sagacity enough to lay on more wood. They go in bodies, and kill many Negroes who travel in the woods. When elephants happen to come and feed where they are, they will fall on them, and so beat them with their clubbed fists and sticks, that they are forced to run away roaring. The grown pongos are never taken alive, owing to their strength, which is so great that ten men cannot hold one of them. The young hang upon their mother's belly, with their hands clasped about her. Many of them are taken by shooting the mothers with poisoned arrows." Another early English traveller, Jobson, and Pyrard de Laval, a Frenchman, appear to have combined the accounts of the *Pongo* of Battel with the chimpanzee, as was also done at a much later period (1738) by De la Brosse. The narratives of these writers have already been quoted. (See page 17.)

This view of the identity of the two African apes was adopted by Buffon, who regarded the pongo as the adult of the animal described by him under the name of the jocko, and at the same time confounded both with the orang-outan of the great Eastern Islands. Later naturalists, whilst admitting the specific and even generic difference of the orang and the chimpanzee, still referred all the accounts of the large African apes to the latter; and it was not until the year 1829 that attention was called by Mrs. Bowdich to the reported existence of a second species of ape on the West African coast. At the close of a paper on the habits of the Diana monkey, published in *Loudon's Magazine of Natural History*, that talented lady refers briefly to the accounts which she had heard of the existence of an animal named *Engé-ena* in the countries to the north of the Gaboon river. She says:—"The natives describe it as the largest of all monkeys, but of a breadth more tremendous than its height; they declare that one blow of its paw would fell a man to the earth. Both males and females are very much attached to their young, and the latter carry them about after death until they drop from their arms. They are fond of imitating men; walk upright; and having seen the natives collect ivory, if they find a tusk, they carry it on their shoulders till they sink with fatigue." Although some of these statements are doubtless fabulous, others have been fully confirmed by recent authorities, and it is remarkable that this reference to the gorilla should have hitherto escaped the attention of naturalists. It was only in 1847 that certain evidence of the occurrence of a second species of African ape was obtained. In April of that year, Dr. Savage, an American missionary, on paying a visit to one of his *confrères*, Dr. Wilson, stationed on the Gaboon river (situated almost exactly under the equator), obtained several skulls of individuals, of both sexes and of different ages, together with some other portions of the skeleton of a large ape, which appeared to him to differ both from the orang and from the chimpanzee. On his return to America, Dr. Savage, with the aid of Dr. Wyman, drew up a description of these bones, which was published in 1840 in the *Boston Journal of Natural History;* he called the species *Troglodytes Gorilla*, conceiving that it was identical with the *Gorilloi* of Hanno. In the following year, Professor Owen, who had received sketches of the skulls from Dr. Savage, and had subsequently obtained some specimens by the aid of Mr. Stutchbury of Bristol, described the species under the name of *Troglodytes Savagei;* and in 1849 an adult male specimen, preserved in spirits, was brought to Paris by Dr. Franquet, a French naval surgeon. A skeleton was subsequently procured for the British Museum, where it has now been for some years; and within the last few months a fine male, nearly adult, and preserved in spirits, was also obtained, and by this the title of the animal to rank as a distinct species has been finally established.

This specimen, which is about five feet in height when placed in an erect position, has the face and the palms of the hands and feet naked and black. The head and neck are thickly covered with brownish grizzled hair of moderate length, which does not hang down at the sides of the face so as to form whiskers, as in the chimpanzee. The ears, also, are much smaller than in the latter species; they are placed very high and far back on the sides of the head. The hair of the shoulders and upper part of the arms is grizzled; that of the back and loins has a sooty tinge. The fore-arms are covered with stiff, black hair, directed up towards the elbow as in the chimpanzee. The hair on the chest is very scanty; but the belly is more thickly clothed, and the hair of this part is reddish-brown, and exceedingly coarse and harsh, having a withered appearance. One of the most remarkable characters of the species, which is now commonly known as the *Gorilla*, is that the digits of both pairs of extremities are united together much further than in the chimpanzee, whose hands nearly resemble those of the human species; in the new species, on the contrary, the fingers of the hands are united nearly as far as the ends of the first phalanges, whilst in the hinder hands the union even goes beyond these, leaving only four little stumpy fingers free. The thumb of the anterior hands is comparatively small; but that of the hinder pair is of enormous size and power, and the whole foot forms a grasping apparatus of the most tremendous character. From the callous marks upon the knuckles it is evident that the *Gorilla*, when on the ground, walks upon all-fours, and that he does not apply the whole lower surface of the foot to the ground; in fact the digits of the hinder hands appear to be bent naturally in such a way as to render this impossible.

The inspection of the specimen above described, which has been most admirably prepared, in spite of almost insuperable difficulties, by Mr. Bartlett, is quite sufficient to justify all the accounts given by travellers of the fearful powers of the gorilla. Although not fully mature, as is shown by the state of its dentition, the vast bulk of its body, far exceeding that of even the most powerful men, its long arms, and enormously large hands and feet, produce an impression of almost irresistible strength; and when we consider that besides this enormous grasping power—to attempt to escape from which would be utterly hopeless—the adult male is furnished with canine teeth as large as those of a carnivorous beast, set in immensely powerful jaws, of which the lower one, as evidenced by the great development of the crests upon the skull, is moved by temporal muscles of enormous bulk; we can easily imagine that such a creature must be one of the most terrible antagonists that a man could well meet with, and cease to wonder that the Negro elephant-hunters should dread him even more than the lion.

Whether the gorilla really attains the immense size of six or seven feet attributed to him by some travellers, is still rather doubtful. The specimen in the Paris

Museum measured about five feet four inches in total height; and a missionary named Walker is said to have obtained one measuring five feet eight inches, but this is the largest on record. Considering the structure of the animal, however, we can easily believe Battel's statement that ten men would be unable to overcome a single adult even of this size; and the great dread which the natives entertain for it, coupled with the difficulty of transplanting such a huge carcass through its native forests to any place frequented by Europeans, is a sufficient explanation of our long ignorance even of the existence of the gorilla.

From the statements of Dr. Savage and others, it appears that the gorilla inhabits the district through which flow the Gaboon and Danger rivers. Its dwelling is in the interior of the country, whilst the chimpanzee is met with on the coast. The tribe of Negroes inhabiting this district is called Mpongwe, whence, according to Dr. Wilson, is derived the name of *Pongo*, applied to the species by Battel—the native name of the animal being *Engé-ena*.

In their native forests the gorillas live in troops, which, however, are not so numerous as those of the chimpanzees, and consist principally of females; and all the natives who furnished Dr. Savage with information upon their habits, agreed in stating that there is only one adult male to each troop, and that as the young males grow up, they engage in contests for the superiority, when the strongest, by killing or driving off all the others, establishes himself as the chief of the band. The adult male, according to the statements of the Negroes, never meets a man in the woods without attacking him. When first seen, he sets up a fearful howling, the sound of which has been compared to the syllables *kha-ah! kha-ah!* opens his mouth to exhibit his terrible teeth, and contracts the skin of his face, so as to acquire an appearance of incredible ferocity. The females and the young disappear with the first sound of battle, and the male then advances upon his enemy in a state of perfect fury, repeating his cries at every step. Of course the hunter's only chance under such circumstances is to kill his assailant with a single shot; and as this is not always an easy matter, the Negroes are said to recommend the adoption of a course which certainly requires more coolness than falls to the lot of most men. The best plan of making sure of a gorilla, according to this account, is to allow him to approach until he grasps the barrel of the gun, and then to fire at the moment when, as his custom is, he is about to bite the muzzle. If the piece miss fire, the gorilla is said to crush the barrel between his teeth, when, of course, he makes short work with his unfortunate antagonist. Hence, as we may suppose, the Negroes are not very anxious to go in pursuit of the gorillas, and only attempt their destruction in self-defence, when they come suddenly upon them in journeying through the forest, or in their elephant-hunting expeditions. The destruction of a gorilla is looked upon as a most honourable exploit. Dr. Savage records a case in which a Negro slave, having succeeded in killing an elephant, on his return met with a male gorilla, which, being a good marksman, he shot, and soon afterwards, falling in with a female, killed her also. These feats, performed in a single day, were looked upon as almost superhuman; the fortunate slave was immediately set free, and pronounced the prince of hunters. Captain Wagstaff, who brought the first skulls of the gorilla to England, furnished Professor Owen with information of a somewhat similar nature, and added that when the natives succeed in killing one of these animals, they make a *fetish* of the skull; those brought home by him had been used in this way, and still exhibited traces of sacred marks in the form of red and white streaks. Although the male is thus so formidable an enemy to man, Dr. Savage denies that there is any truth in the stories of their forcing Negresses to accompany them to their retreats in the woods, or attacking the elephants with clubs, narrated both of this and the preceding species by the older writers. These stories, however, are confirmed by a recent French traveller, M. Gautier Laboulaye; but upon what authority does not appear. Their food, as stated by Battel, consists of nuts and fruits; and, according to Dr. Savage, they are especially fond of the acid fruits of some species of *Amomum*, and of those of the oil palm (*Elaïs guineensis*), the Papaw (*Carica papaya*), and the Banana (*Musa sapientum*). They are also said to be partial to sugar-canes.

THE ORANG-OUTAN (*Simia Satyrus*). Plate 1, fig. 2.

The remarkable man-like apes of the great Indian islands, appear to have been entirely unknown to the ancients, unless Pliny's mention of Indian satyrs refers to the orang-outan. It is not, indeed, until the middle of the seventeenth century, that we find any notice of these animals in the writings of Europeans. About this period, the *Orang-outan* is mentioned by Johnston in his "Historia Animalium," but described as brought from Angola. In 1658, however, some genuine observations upon the orang, were published in Holland; their author, Bontius, a Dutch physician residing in Batavia, having seen "several of these satyrs of both sexes" in that country. The English anatomist, Tyson, whose work on the chimpanzee has already been quoted, also refers to the orang-outan, upon the appearance and habits of which he had obtained some details from a French missionary, named Lecomte; and a little later, Leguat, a French voyager, gave a description of a large ape which he saw in captivity in Java, and which could only have been an orang-outan. The notices of the species then become more frequent in works on Natural History; but the two great authorities of the eighteenth century, Linnæus and Buffon, both agreed in regarding the great Indian and African apes as belonging to a single species. They were imperfectly distinguished by Gmelin, who still describes the pongo as a variety of the orang-outan, inhabiting both Java and Guinea. Since the chimpanzee has been clearly recognized as a species distinct from the orang, there has been a tendency to multiply the species of the large Eastern apes; and we find no less than six supposed species described by different authors, principally from peculiarities in the structure of the skeleton. It would appear, however, from the recent observations of Mr. A. R. Wallace upon the orangs of Borneo, that some of the characters which have been chiefly relied upon for the discrimination of these species are fallacious. The Bornean orangs all seem to be referable to two species, the differences between which are, as Mr. Wallace observes, well marked in the males, but much less distinct in the females. Both these species appear to be called *Orang-outan*, or "man of the woods," by the Malays of the coast of Borneo, but the Dyaks, who are more familiar with them, call them *Mias*, and distinguish two or three kinds by particular names.

The largest species found in Borneo, and the one which is most abundant there, may be regarded as the true orang-outan, or *Simia Satyrus* of Linnæus. It is called *Mias Pappan*, *Mias Chappan*, and *Mias Zimb* by the natives; the second name, according to Sir James Brooke, being applied to it by the Malays. The arms are of great length, reaching nearly to the heel when the animal is in an erect posture; the body is covered with long reddish hairs, which form a long beard pendent from the chin; the hairs of the fore-arms are turned towards the elbow, in the same way as in the chimpanzee and gorilla; the face is naked, and, in the males, greatly expanded at the sides by two large fatty protuberances on the cheeks; the ears are small and rounded, and greatly resemble those of man in form; and the lips are very large, and capable of being protruded and retracted to a great extent. The largest adult males met with by Mr. Wallace in Borneo, measured four feet two inches in height, from the crown of the head to the heel; but if we can believe the accounts of other travellers, the species must attain much larger dimensions. M. Temminck mentions his having heard of a Bornean specimen of five feet three inches in height; and a specimen from Sumatra, described by Dr. Clarke Abel, was said to measure about seven feet. The females are considerably smaller than the males.

In the orang there is a remarkably large guttural pouch descending in front of the sternum, and communicating with the wind-pipe, from which it may be greatly inflated with air. This occurs also, although far less developed, in the chimpanzee and gorilla.

The observations of M. Salomon Müller, and of Mr. Wallace, have furnished us with a tolerably complete history of the orang-outan in a state of nature. This animal lives in the lofty primæval forests of Borneo and Sumatra, but only in the swampy districts, where the forest is unbroken, and the interlacing branches afford him a means of passing readily from tree to tree, without the labour of descending to the ground. Mr. Wallace describes it as a "singular and most interesting sight to watch a mias making his way leisurely through the forest. He walks deliberately along the branches, in the semi-erect attitude which the great length of his arms, and the shortness of his legs give him; choosing a place where the boughs of an adjacent tree intermingle, he seizes the smaller twigs, pulls them towards him, grasps them together with those of the tree he is on, and thus, forming a kind of bridge, swings himself onward, and seizing hold of a thick branch with his long arms, is in an instant walking along to the opposite side of the tree. He never jumps or springs, or even appears to hurry himself, and yet moves as quickly as a man can run along the ground beneath." Unlike the chimpanzee and the gorilla, it is a solitary creature; Mr. Wallace says, that he has "never seen two adult animals together; but both males and females are sometimes accompanied by half-grown young ones, or two or three of the latter go in company."

When not disturbed, or in search of food, the orang appears to be sedentary in its habits. It sleeps every night on a nest made by breaking off the leafy branches of trees, and laying them over each other upon a forked horizontal branch, until it forms a bed so thick as to conceal it entirely from below; in rainy weather it is also said to cover itself in a similar manner with small branches and leaves, and to keep its bed till about nine o'clock, when the sun has become hot enough to disperse the mists. The nest is usually placed at about fifty or sixty feet from the ground. As the same animal appears seldom to use these nests more than once or twice, they are very abundant in places frequented by the mias.

The food of the orang-outan consists almost entirely of fruits; but when these are scarce, the tender shoots and leaves of trees do not come amiss to him. An old male was once found to have in his stomach fragments of the bark of trees of upwards of a foot in length. According to Mr. Wallace they seem to prefer their fruit unripe, and many of them are intensely bitter; particularly the large, red, fleshy arillus of one fruit, which seems to be an especial favourite. Of another large fruit they only eat the small seed, and in search of this destroy great quantities of the fruit. "The Durian (*Durio zibethinus*)," says Mr. Wallace, "is also a great favourite, and the mias destroys large quantities of this delicious fruit, in places where it grows surrounded by lofty jungle, but will not pass over clearings to get at them. It seems wonderful how the animal can tear open this fruit, the outer covering of which is so thick, tough, and densely covered with strong, conical spines. It probably bites a few of these off first, and then, making a small hole, tears the fruit open with its powerful fingers." In some places the orangs appear to be somewhat migratory in their habits, moving after particular fruits of which they are fond; thus they are said to move into the southern parts of Borneo, and to make their appearance on the right bank of the river Dousson, at the period when the fruits of a certain species of fig (*Ficus infectoria*) are ripe. After this they disappear from those localities. They seem rarely to descend to the ground except in search of water, which they drink by taking a little up in their hands, and letting it flow into the lower lip, which is protruded so as to form a sort of channel for this purpose. When on the ground they walk on all-fours, like the other apes, and appear to have less power of maintaining themselves in an erect posture than the chimpanzees. Some individuals, in confinement, have been seen to move along a flat surface by resting on the knuckles of their hands, and then throwing the body and legs forward in the manner of a lame man on crutches; this mode of progression is not natural to the species, as has been supposed, but appears only to be adopted by sickly individuals.

The orangs appear to have little fear of man, but will often stare down upon an intruder for a few minutes and then remove slowly to a short distance. When pursued, however, as they often are by the Dyaks, who kill them with poisoned arrows and eat their flesh, they manifest some alarm, and endeavour to get as quickly as possible into the loftiest tree in their neighbourhood, when they climb rapidly to the higher branches, breaking off the smaller boughs in their passage, and throwing them down as if to intimidate their pursuers. This habit has been exaggerated by some travellers into a truly offensive action, and the orang has been described as throwing branches down at its enemies; whilst, on the other hand, M. Temminck has altogether denied that the creature breaks the boughs on purpose to throw them down. According to Mr. Wallace, however, this is actually the case, although, as he states, the orang "does not throw them *at* a person, but casts them down vertically." He adds that "in one case, a female mias, on a durian tree, kept up for at least ten minutes a continuous shower of branches and of the heavy spined fruits, as large as 32-pounders, which most effectually kept us clear of the tree she was on. She could be seen breaking them off and throwing them down with every appearance of rage, uttering at intervals a loud pumping grunt, and evidently meaning mischief."

In this way the orang remains at the top of the tree on which he has taken refuge, never venturing to descend either to attack his pursuers, or to escape, by means of the interlacing lower branches, to another tree; but when badly wounded, he sets about making a bed similar to his ordinary nightly lair, on which he lays himself down to die. This nest effectually screens him from below, and he will not quit it after it is once completed. Mr. Wallace states that he lost two specimens in this way; they died upon their beds, and he could not get any one to climb up or cut down the tree until the next day, when decomposition had commenced.

The tenacity of life in the orangs is exceedingly great, and it usually requires from six to twelve bullets in the body to kill them. An example of this tenacity of life was afforded by the Sumatran specimen described by Dr. Clarke Abel, and already alluded to on account of its great size. This animal was found at a place called Ramboon, on the north-west coast of Sumatra, by a boat's crew who had landed to procure water. He was upon one of a few trees standing in the midst of cultivated ground. On the approach of the party he came to the ground, but soon made his escape to another tree at a little distance, and was afterwards driven to take refuge in a small clump. Here his movements were so quick that it was very difficult to get a shot at him; and it was only after cutting down several of the trees that his pursuers succeeded in shooting him. He received five balls, some of which struck him in the body, when he relaxed in his exertions, and reclining exhausted on one of the branches of a tree, vomited a considerable quantity of blood. "The ammunition of the hunters being by this time expended," says Dr. Abel, "they were obliged to fell the tree in order to obtain him; and did this in full confidence that his power was so far gone that they could secure him without trouble; but were astonished, as the tree was falling, to see him effect his retreat to another with apparently undiminished vigour. In fact, they were obliged to cut down all the trees before they could drive him to combat his enemies on the ground, against whom he still exhibited surprising strength and agility, although he was at length overpowered by numbers, and destroyed by the thrusts of spears, and the blows of stones and other missiles. When nearly in a dying state, he seized a spear made of a supple wood, which would have withstood the strength of the stoutest man, and shivered it in pieces. In the words of the narrator, 'he broke it as if it had been a carrot.' It is stated by those who aided in his death, that the human-like expression of his countenance and piteous manner of placing his hands over his wounds, distressed their feelings, and almost made them question the nature of the act they were committing. When dead, both natives and Europeans contemplated his figure with amazement. His stature, at the lowest computation, was upwards of six feet—at the highest it was nearly eight;" but, from the examination of the skin, Dr. Abel concludes that he must have been about seven feet in height.

M. Salomon Müller also mentions a male orang, about four feet in height, which had been wounded by the Dyaks with poisoned arrows, and afterwards captured by them alive. Although suffering greatly from his wounds, this animal exhibited great strength and ferocity; he would rise slowly from his ordinary crouching position, and then, seizing a favourable moment, would dash impetuously towards the spectators, darting his long arms through the bars of his cage, and generally attempting to reach the faces of those nearest to him.

Like the other apes, it appears that the orang, when attacked, never makes use of his large canine teeth to defend himself, but trusts entirely to the enormous strength of his long arms. His enemies, however, in the forest solitudes which he frequents are very few. In Sumatra, the tiger may occasionally pounce upon an unlucky orang, when on his way to the water; but in Borneo, the only inhabitant of the forests that would be at all a formidable enemy to the orang is the Bornean bear, and as this animal is almost as exclusively devoted to a vegetable diet as the orang himself, it is hard to see what cause of quarrel can arise between them. Mr. Wallace says—"The Dyaks are unanimous in their statements that the mias never either attacks or is attacked by any animal, with one exception which is highly curious, and would hardly be credible were it not confirmed by the testimony of several independent parties, who have been eye-witnesses of the circumstance. The only animal the mias measures his strength with is the crocodile of these regions (*Crocodilus Biporcatus?*). The account of the natives is as follows:—'When there is little fruit in the jungle, the mias goes to the river side to eat the fruits that grow there, and also the young shoots of some palm-trees which are found at the water's edge. The crocodile then sometimes tries to seize him, but he gets on the reptile's back, beats it with his hands and feet on the head and neck, and pulls open its jaws till he rips up the throat. The mias always kills the crocodile, for he is very strong. There is no animal in the jungle so strong as he.'"

The female orangs, like the other large apes, produce only one young at a birth, and this clings for a considerable time to the long hair of its mother's body, and is thus carried about; the four limbs of the mother being left at perfect liberty. In fact, so little does the presence of a young one impede the movements of the mother, that Mr. Wallace mentions his having shot two females, bearing their young in this way, without being aware of the existence of the latter until both fell to the ground. It is by shooting the mothers that the natives obtain nearly all the young orangs which they sell to Europeans.

For some time after their birth, the young orangs appear to be nearly as helpless as the human infant, although of course the mere fact of their supporting themselves by grasping the hair of their mother, is evidence of a far greater amount of strength than is possessed by a young child. Mr. Wallace has published a most interesting account of the habits of an "infant" orang-outan which he obtained by shooting its mother, from which we shall extract a few passages. He fed it with rice-water out of a bottle with a quill in the cork, which, after one or two trials, it sucked very well. "When a finger was placed in its mouth, it would suck at it with remarkable vigour, drawing in its little cheeks with all its might, thinking, no doubt, it had got hold of the right thing at last, and wondering that all its exertions could get no milk out of it. It would persevere for a long time, till at last it gave up with despair and disgust, indicated generally by a very baby-like scream." It was quiet when nursed, but cried when laid down alone. When being washed it winced, "and made ridiculously wry faces" when the cold water was poured on its head, but it enjoyed being rubbed dry, and was particularly delighted with being brushed. At first it clung vigorously with its four hands to anything that was within its reach; and on one occasion having caught hold of its owner's whiskers and beard, clutched them so tightly that he had considerable difficulty in getting free. From the want of its natural grasping exercise, Mr. Wallace found that his baby orang was getting rather weak in its limbs, and he therefore contrived a sort of ladder upon which it might hang. This, however, did not answer; the sticks not affording it a convenient hold for all its four hands. It would hang for a time by two hands only, and then, getting tired of this posture, would move one hand over to the opposite shoulder to grasp its own hair; when "thinking, no doubt, that that would support it much better than the stick, it would leave hold with the other hand, and come tumbling down on to the floor." Mr. Wallace then prepared a sort of artificial mother for it, by rolling up a piece of buffalo-skin into a bundle with the hair outside. This suited it much better, but, unfortunately, it was only too natural. "The poor little creature thinking it had recovered its mother was continually trying to suck. It would pull itself up close by the strength of its arms, and try everywhere for a likely place, but only succeeded in getting mouthfuls of wool, when of course it would be greatly disgusted, scream violently, and if not rescued would soon let itself fall."

When fed with a spoon this infant orang indicated its approval or dislike of the food offered to it by the most ludicrous changes of its countenance—licking its lips, drawing in its cheeks, and turning up its eyes, like a true epicure, when the food was to its taste—turning the mouthful about with its tongue, and pushing it out between its lips when it was not palatable. If the same food was continued it would scream and kick violently, exactly like a baby in a passion. About a month after it came into Mr. Wallace's possession, it began to show some signs of learning the use of its legs. When laid on the floor it would push itself along, or roll over, and when left in its cradle would lift itself up into an erect posture, and once or twice succeeded in tumbling out. It did not, however, grow, or gain strength—a circumstance which Mr. Wallace attributes to his being unable to feed it with milk; and it died in a miserable state after being in his possession about three months.

The specimens of the orang-outan which have been brought to Europe have been, for the most part, young individuals. In their general habits, their gentleness and docility, they resemble the chimpanzees; but appear scarcely to be so lively as those animals. Like them, they exhibit a great affection for men, and especially for those who have the care of them; they also sometimes manifest considerable attachment for other animals, especially cats, but appear to entertain a sort of contempt for other monkeys, although they will occasionally condescend to play with them. Like the chimpanzee they learn to sit at table, eat with a knife and fork, drink from a glass, etc.; they sometimes acquire a taste for intoxicating drinks, and under the influence of this have even been known to steal both wine and spirits.

Full-grown specimens do not appear to bear captivity, and indeed their great strength and ferocity render them dangerous. Nevertheless, some of the older travellers, such as Leguat, Bontius, D'Obsonville, and Relian, mention their having seen large specimens in confinement in Java; and some of these, from their size, must have been adult or nearly so. The accounts of these travellers ascribe a wonderful amount of modesty to these apes, especially the females; the last-mentioned writer says that both the male and female "were very bashful when you looked fixedly at them, and the female would then throw herself into the arms of the male and hide her head in his breast. This touching sight I have witnessed with my own eyes."

Of the second species of orang found in Borneo, called *Mias Kassu* by the natives (*Simia Morio* of Professor Owen), Mr. Wallace says that its habits are precisely similar to those of the larger species, from which it is distinguished by the absence of the fatty excrescences on the cheeks, and by the much greater comparative size of the teeth, and especially of the canines in the males. The females of the two species appear to be scarcely distinguishable, except by the difference of size, and by the smaller ones having the two middle incisor teeth in the upper jaw proportionally larger, a character which also occurs in the smaller males. Mr. Wallace also heard the Dyaks mention a third kind of orang under the name of *Mias Rambi*, which is said to equal the large species in size, but to be destitute of the cheek-excrescences, and clothed with very long hair. Mr. Wallace supposes it to be founded on specimens of the large orang, in which the excrescences have been but little developed. The other described species of the genus *Simia* appear to have been established on insufficient characters.

That we have devoted so much space to the natural history of the preceding large apes—the chimpanzee, the gorilla, and the orang-outan—is to be attributed to the interest which attaches to these creatures, as forming, next to our own species, the highest members of the animal kingdom. This circumstance, and the exaggerated notions frequently entertained of the extent to which these creatures approach man, both in their structure and endowments, have led us to dwell upon them at far greater length than will be necessary in treating of the rest of the Quadrumana, and also to confine ourselves principally to their history in a state of nature, in which, alone, their true character can come freely into play.

THE GIBBONS, or LONG-ARMED APES (Genus *Hylobates*).—The remainder of the true apes all belong to the genus *Hylobates*, the species of which are now commonly known as Gibbons; they are the *Long-armed Apes* of the older writers on zoology. They are all inhabitants of the region of the East Indies—a few living on the continent of Asia, whilst the majority are confined to the islands of the Eastern Archipelago, especially Sumatra, Java, and Borneo.

Pliny's reference to satyrs living in the East Indies is probably founded partly upon the imperfect accounts of gibbons which had reached him. Thus he says, that "Tauron mentions a savage tribe, under the name of *Choromandæ*, which have no speech, but utter horrid screams; they have hairy bodies, fiery eyes, and teeth like dogs;" and adds that "Megasthenes relates that amongst the nomade Indians there is a tribe which, instead of a nose, have only two holes; they have bandy legs, which they can twist about like snakes, and are called *Scyritæ*." Marco Polo states that the inhabitants of Java were in the habit of shaving and embalming the bodies of gibbons, which they then sold as pigmies to the merchants who visited their coast in search of drugs and spices. This was probably done in still more ancient times, and it may have been by such means that the ancients became aware of the existence of these so-called satyrs.

The gibbons have the arms still longer in proportion than the orangs, but, like them, have the hairs of the fore-arm turned up towards the elbow. They have the palms of all the hands naked; the thumbs of the fore-hands are cleft very low down, so that the metacarpal joint of the thumb is not included in the palm of the hand, and the thumbs thus appear to consist of three joints; the first and second toes are more or less united, and this is also sometimes the case with the second and third. The skull is smaller than in the orangs, and the brain is smaller, and presents a greater resemblance to that of the monkeys, and less likeness to that of man than the same organ in the chimpanzee and orang. The intelligence of these apes is also inferior. A further difference from the other apes is to be found in the presence of callosities upon the buttocks of the gibbons—a character which is of importance as indicating an approach to the monkeys. With one exception—that of the siamang—they appear to be quite destitute of the large sacs appended to the wind-pipe, which occur in the orangs, and also, but rather less developed in the chimpanzee and gorilla, and even in some of the lower monkeys. The number of ribs varies from twelve to fourteen.

The general habits of the gibbons appear to be rather sedentary than otherwise. Their movements are slow; their nature gentle, and rather melancholy; and they do not appear to lose their mildness of disposition so much as the other apes, as they increase in age. They live in troops in the forests, and usually raise a tremendous howling noise in concert in the morning and evening. Of the rather numerous species of gibbons described, we need only refer to a few of the best known. The first species that was accurately described and figured was—

THE WHITE-HANDED GIBBON (*Hylobates Lar*)—the *Grand Gibbon* of Buffon, which was placed by Linnæus, in the earlier editions of his "Systema Naturæ," in the same genus with the orangs and the human species. This animal, which is between two and three feet in height, is of a uniform black or brownish-black colour, with the exception of the backs of the four hands, and a broad band encircling the face, which are whitish. The black hair of the body and limbs is erect and woolly; the white hair of the hands is coarse, harsh, straight, and depressed. It is an inhabitant of the peninsula of Malacca, of Siam, and probably also of some neighbouring regions. The living specimen observed by Buffon is described by him as being "of a tranquil nature, and of gentle manners. Its movements were neither very lively nor very precipitate. It received gently what was given it to eat; and it was fed on bread, fruit, almonds, etc. It had a great dread of cold and moisture, and did not live long out of its native country."

THE HOOLOC (*Hylobates Hooloc*) is another continental species, found principally in the district of Assam, as far north as the 28th degree of latitude. It is one of the largest species, measuring, when full grown, upwards of four feet in height. It is covered with harsh, shining, black hair, with a broad white or greyish band across the forehead, above the eyebrows.

Their food consists principally of fruits; but they also eat some kinds of grass, and the young shoots and leaves of the peepul and other trees, which they chew, swallow the juice, and then reject the indigestible part. They are said to go in herds of from one hundred to one hundred and fifty individuals, raising a howling noise, which may be heard at a great distance. Dr. Burrough, who forwarded an account of the habits of this species to Dr. Harlan, says that "they are easily tamed, and when first taken, show no disposition to bite, unless provoked to anger, and even then manifest a reluctance to defend themselves, preferring to retreat to some corner rather than to attack their enemy;" but, according to Mr. Owen, as quoted by Mr. Blyth, they occasionally attack the natives, and bite them severely; and Mr. Owen himself was once surrounded by a troop of them, which he disturbed whilst washing themselves in a stream, and felt convinced that, had he not taken to his heels, they would have attacked him. The same gentleman states that these apes appear to destroy large snakes. His attention was once attracted by the noise made by them in some trees over his head. On stopping to examine into the cause of the uproar, he was disagreeably startled by the sudden fall of a python, six or seven feet in length, which was bitten in many places, and nearly dead.

According to Dr. Burrough the hoolocs walk erect with great ease, balancing themselves by raising their arms above their heads; but if urged to greater speed they drop their hands to the ground, and assist themselves forward, jumping rather than running. If they succeed in making their way to a grove of trees, they swing with such astonishing rapidity from branch to branch and from tree to tree, that they are soon lost in the forest. In confinement they are gentle and tractable, and appear to entertain some affection for their master. In drinking they dip their hands into the liquid and then suck their fingers; but when very thirsty, they will take up the vessel containing their drink with both hands, and carry it to their lips, so as to get a more considerable draught. A specimen in Dr. Burrough's possession was fed principally upon fruits, boiled rice, and bread and milk, but would also eat cooked animal food, especially chicken and fried fish; he rejected beef and pork; he liked eggs, coffee, and chocolate, and was very fond of insects, searching in the crevices for spiders, and if a fly chanced to come within his reach, would dexterously catch it in one hand. Hence we may infer, that insects constitute a portion of the natural food of the hooloc, and probably also of the other gibbons. The cry of the specimen just referred to, was a loud and shrill *whoo-whoo, whoo-whoo.*

The hooloc was considered by Mr. Ogilby to be probably the origin of Pliny's *Scyritæ*, and described by him, in consequence, under the name of *Hylobates Scyritus.*

THE SIAMANG (*Hylobates Syndactylus*) is the largest and most powerful species of the genus, and is entirely of a black colour, with the exception of a few hairs of a reddish tinge upon the eyebrows and chin. The hair is long and coarse, but glossy; the belly is nearly naked, and the throat completely so; it incloses a large sac communicating with the larynx, which can be filled with air at the pleasure of the animal, and when thus distended forms a huge goitre-like swelling of the neck. This sac, which exactly resembles that of the orang-outan, is supposed to assist in augmenting the power of the tremendous voice of this animal; it also indicates an approach, on the part of the siamang, to the higher apes, which, like him, occur in the forests of Sumatra.

The siamang was the first species of gibbon in which the union of the first and second digits of the hinder hands was noticed; and indeed this character is presented by this animal so much more strongly than in the other species of the genus, that it well deserves the name of *Syndactylus*, applied to it by Sir Stamford Raffles. This peculiarity has even induced Dr. Gray and M. Boitard to propose the formation of a separate genus for its reception.

M. Duvaucel, who discovered this species in the neighbourhood of Bencoolen in Sumatra, states that the siamangs are very common in the forests, where they assemble in numerous troops, led by a chief, whom the Malays believe to be invulnerable, probably because he is more powerful, active, and difficult to get at than the rest. These troops salute the rising and setting sun with the most terrific cries, which may be heard at a distance of several miles, and which, when near, stun those whom they do not frighten. This is the morning call of the mountain Malays, but to the inhabitants of the towns it is a most insupportable annoyance. By way of compensation, they preserve a most profound silence in the daytime, at least if their repose is not disturbed. M. Duvaucel adds, that they are slow and heavy in their gait, so that they may be easily caught when surprised, especially on the ground; but, on the other hand, their vigilance is so great, and their sense of hearing so delicate, that it is by no means an easy matter to surprise them, as at the least noise, even though it be at a mile's distance, they take to flight. On the ground they advance by jerks, using their long arms like crutches. When one of a troop is wounded it is immediately abandoned by the rest, unless it happens to be a young one, when the mother stops, falls with it, and, uttering the most lamentable cries, attacks the enemy with open mouth and extended arms. Under ordinary circumstances also, the females, according to M. Duvaucel, bestow an amount of care upon their offspring which seems almost to belong to a rational sentiment. He says—"It is a curious and interesting spectacle to see the females carry their young to the river, wash their faces in spite of their childish outcries, and altogether bestow upon their cleanliness a time and attention, which, in many cases, the children of our own species might well envy."

In confinement the siamang, according to M. Duvaucel, is gentle, but stupid and sluggish; in fact, from his account it would appear, that the very gentleness of the animal is merely due to its apathy. Mr. George Bennett, however, who obtained a specimen of this animal at Singapore in 1830, has published a far more favourable account of its endowments. Mr. Bennett describes his specimen as always walking erect when on a level surface, sometimes holding his arms down so as to assist himself, by touching the ground with his knuckles occasionally, but more usually raising them over his head, ready to seize a rope and climb up on the approach of danger. This animal preferred vegetable food, and was especially fond of carrots; when these were put upon the table for dinner, the siamang, although usually very decorous in his behaviour, immediately forgot his good manners, and it was not without some difficulty that he could be prevented from attacking them uninvited. "A piece of carrot," says Mr. Bennett, "would draw him from one end of the table to the other, over which he would walk without disturbing a single article, although the ship was rolling at the time; so admirably can these creatures balance themselves." He would drink tea, coffee, and chocolate, but never acquired a taste for wine or spirits; he was excessively fond of sweet things, and sometimes attempted to lift off the lid of the jar in which some cakes were kept; he would eat animal food, especially fowl; and a lizard having been caught on board was placed before him, when he instantly seized it, and devoured it greedily. This specimen exhibited great attachment to his master, and when first sold to a European owner, made his escape several times, in order to get back to a young Malay who had brought him from Sumatra to Singapore. He exhibited considerable activity in climbing about the rigging of the ship, was greatly irritated when confined or disappointed in any way, and on passing the Cape, finding the temperature too low to allow of his sleeping on the maintop, as had previously been his habit, he showed an eager desire to be taken into his master's arms, and to be permitted to pass the night in the cabin, for which he afterwards evinced such a decided partiality, that, on the ship getting again into warmer latitudes, he would not resume his old station in the maintop, but showed a strong determination to remain where he found himself so comfortable. We cannot quote farther from the interesting account of Mr. Bennett; but the preceding statements will be sufficient to show that the endowments of this animal are far higher than we should be led to believe from the statements of M. Duvaucel.

THE AGILE GIBBON (*Hylobates Agilis*).—The agile gibbon, which is called *Ungka-puti* by the Malays (*Ungka* being apparently a generic name for the gibbons) is, like the siamang, a native of Sumatra, where it was discovered by M. Duvaucel. It is, however, far less numerous in the forests of that island than the siamangs, and is more frequently met with in pairs than in troops. The colours of the agile gibbon are more variegated than those of the preceding species; the head and shoulders, the inside of the arms and legs, and the whole front of the body being of a deep coffee-brown colour; whilst the occiput, the whole of the back, except the shoulders, and the outside of the thighs are pale brownish-white. The sides of the face are adorned with bushy white whiskers, and a narrow white band runs across the forehead above the eyebrows.

M. Duvaucel contrasts the agility of this gibbon with the comparative sluggishness of the siamang as described by him; but it seems probable, from the narratives of other observers, that the difference between these two species in this respect is far less than M. Duvaucel would make it appear. In describing its surprising activity, the French naturalist says—"It escapes like a bird, and like a bird can only be shot, so to speak, flying; scarcely has it perceived the most distant approach of danger when it is already far away. Climbing rapidly to the tops of the trees, it there seizes the most flexible branch, poises itself two or three times to secure its balance and acquire a sufficient impetus, and thus clears, time after time, without effort as without fatigue, spaces of forty feet and upwards." The same writer adds, that although deprived of the guttural sac, so conspicuous in the siamang, its cry is very nearly the same, so that either this organ does not produce the effect of increasing the sound usually attributed to it, or it is replaced in the present species by some analogous formation. This cry is compared to the syllables *wou-wou*, frequently repeated with peculiar modulations. A somewhat similar cry would appear to be common to most of the gibbons, and several of the species, the present one amongst others, receive the name of *Wou-wou* from the Malays.

One of these is the CINEREOUS GIBBON (*H. Leuciscus*), a native of Java and the Molucca Islands, specimens of which are occasionally brought to Europe. Of the habits of this and the other species in a state of nature, scarcely anything is known; but we may presume that they are very similar to those which we have been describing.

The second group of the Simiadæ, that of the true *Monkeys*, differs from the apes just described by the constant presence of callosities upon the buttocks, and by the almost constant presence of cheek-pouches and a long tail. The arms are never so disproportionate in length as those of the apes; and yet the general structure of the body is much further removed from that of man. In their character, also, the monkeys generally exhibit a great difference from the apes—they are vivacious and petulant in their deportment, and usually very capricious in their temper; presenting in these respects a marked contrast to the grave and somewhat melancholy nature of the species previously described. It is in the East Indies, in the same region inhabited by the orangs and the gibbons, that we find those monkeys which are most distinguished from the rest of their tribe by ape-like characters; though even here we meet with species of a more animal type, and resembling their African brethren; whilst the great majority of the latter present a wider divergence from the apes, and gradually approach the baboons.

THE HOONUMAN (*Semnopithecus Entellus*).—The Indian monkeys above alluded to form the genus *Semnopithecus* of F. Cuvier, which is characterized by the slender form and long limbs and tail of the species, by the want of cheek-pouches, and by the presence of thumbs on the fore-hands. The canines of these monkeys are but slightly developed, and the molars have their tubercles so arranged as to form transverse ridges —a structure which indicates that the animals rather feed upon the leaves and tender shoots of plants than upon fruits; and this is also shown by the structure of the stomach, which is very long and much dilated in parts, especially at the anterior end into which the œsophagus or gullet opens. These dilated portions being separated by constrictions, the stomach acquires a complicated appearance, somewhat resembling that of the ruminant quadrupeds. It is a remarkable fact in connection with this peculiarity of structure, that the stomachs of these monkeys often contain *bezoars*, or concretions of a similar nature to those found in many Ruminants, and which are so highly prized by eastern nations. The monkey bezoars are said to be of more value than those obtained from the Ruminants.

The hoonuman, which is for many reasons one of the most interesting species of this group, is a large monkey—the old males measuring nearly five feet in height—of a yellowish or greyish-white colour, darker on the back, limbs, and tail, and with the face and hands black. The hair above the eyebrows forms a sort of projecting fillet across the front of the head; the face is bordered on each side with light whiskers, and the chin is furnished with a beard, which is peaked and directed forwards. As the animals increase in age the fur becomes darker, until it is of a nearly uniform rusty brown colour.

The hoonuman is an exceedingly abundant monkey in India, especially in Bengal. During the summer it migrates northwards into the hills, travelling as far as Nepaul, and even to the elevated plain of Boutan. It is regarded with great veneration by the Hindoos, who have even deified it, and assigned it a high place in their almost innumerable multitude of gods. They look upon the destruction of a hoonuman with the greatest horror, and believe that the perpetrator of such a crime will certainly die within a year after its commission. M. Duvaucel, from whom we have already quoted, gives an amusing account of the difficulty which he experienced in obtaining specimens, in consequence of this superstitious feeling. As soon as he was seen abroad with his gun, he was surrounded by crowds of natives, who employed themselves assiduously in chasing the monkeys out of gunshot; and during a whole month that a small family of hoonumans remained at Chandernagore, where he was residing, his house was constantly surrounded by Brahmins, who tormented him by incessantly beating tomtoms and drums to scare the four-handed divinities from so dangerous a neighbourhood. On entering the holy city of Goalpara, he saw the trees everywhere covered with these long-tailed deities, which immediately fled with loud cries, whilst a dozen Hindoos surrounded the traveller and endeavoured to impress upon him the danger he would incur by molesting or injuring animals which were nothing less than metamorphosed princes and heroes. Passing on, however, he says he met a princess so seductive that he could not resist the temptation of cultivating a nearer acquaintance with her. He levelled his gun and fired; but then, to quote his own words, he "became witness of a scene which was truly touching and pathetic. The poor animal, which had a young one on her back, had been hit near the heart; feeling herself mortally wounded, she collected all her remaining force for the effort, seized her young one, and was just able to throw it up into the branches of a neighbouring tree, before she fell and expired at his feet. An incident so touching," adds M. Duvaucel, "made a greater impression on me than all the discourses of the Brahmins; and the pleasure of obtaining a specimen of so beautiful an animal, was, for once, incapable of contending against the regret which I felt for having killed a creature which appeared to be bound to life only by the most estimable and praiseworthy feelings."

As might be anticipated, these monkeys, being protected from all injury by the superstitions of the inhabitants, abound to such an extent, and feel so little fear of man, that they become a positive nuisance to those whose minds are not so constituted as to enable them to regard the hoonuman in the light of a divinity. They take up their abode in the topes or groves of trees which the Hindoos plant around their villages, and are often so numerous in the towns that Sir James Forbes considered that in Dhuboy there were more monkeys than human inhabitants. They visit the houses of the natives, who willingly provide them with food; and in the villages they often plunder the peasants, who, however, regard their visits as a high honour. At Dhuboy, according to Forbes, the roofs of the houses seemed to be entirely appropriated to the accommodation of the monkeys, and the same writer gives a ludicrous account of his having been compelled to remove from a shady verandah, in consequence of the pertinacious pelting administered to him with fragments of tiles and mortar from the roof of an opposite house by these animals. He also describes a curious mode of revenge sometimes adopted by the Hindoos of that town, in which the hoonumans are the principal agents. It appears that before the commencement of the rains, about the middle of June, it is usual to turn all the tiles on the roofs of the houses. The tiles are not fixed with mortar, but accurately adjusted one over the other, so that, if this operation is performed just before the setting in of the rains, the roof will be water-tight during the wet season, and afterwards a few gaps are of little consequence. It is at this period, when the tiles have been turned and the first rains are hourly expected, that the Hindoo who has a grudge to gratify repairs at night to the house of his adversary, and strews a quantity of grain over the roof. This is soon discovered by the monkeys, who assemble in great numbers to pick up their favourite food; and, as much of the grain naturally falls between the tiles, they soon nearly unroof the house in their efforts to get at it.

In other respects they appear to be exceedingly mischievous and destructive. They often descend in troops upon the cultivated fields; and it is said that when the troop is pretty numerous, they will strip a maize field of moderate size in a few hours. The disposition of the males, also, is described as so libidinous, that it is not safe for a woman to pass their haunts. The only return they make for all the damage they do, and all the kindness shown them by the natives, is that, according to Forbes, they frequently destroy poisonous snakes. They seize them by the neck when asleep, and then, "running to the nearest flat stone, grind down the head by a strong friction on the surface, frequently looking at it, and grinning at their progress. When convinced that the venomous fangs are destroyed, they toss the reptile to their young ones to play with, and seem to rejoice in the destruction of the common enemy." The tigers and other carnivorous quadrupeds of India, having no such scruples as those of the human inhabitants of the country, are said to wage a constant war with the hoonumans. The tiger is described as taking up a position at the foot of the tree in which the monkeys have taken refuge, when his roaring so frightens them that they tumble down and he devours them at his leisure.

The cause of the veneration in which the hoonuman is held by the Hindoos, which, indeed, is also extended, although in a less degree, to other monkeys, is doubtless partly to be ascribed to the Brahminical doctrine of metempsychosis, but probably still more to its supposed derivation from one of the personages of their mythical history. In the great epic poem of the "Ramayan," which is devoted to the exploits of Rama, an incarnation of Vishnu, that hero contracts an alliance with Hoonuman, king of the monkeys, in his war with the Rackshasas of Ceylon. Throughout the war Hoonuman plays the principal part, next to Rama himself; but having stolen a mango-tree from a garden in Ceylon for the purpose of giving it to the Hindoos, he was condemned to have his face and hands blackened, a mark of disgrace which his descendants continue to bear to the present day. According to another account, Hoonuman was condemned to be burned by the giant from whom he stole the mango, but escaped with no greater injury than the singeing of his face and hands. We learn also that Hoonuman endeavoured to set Ceylon on fire, by means of a lighted tar-barrel tied to his tail; but, finding unexpectedly that this appendage was not fire-proof, he hastened to the Himalayas and dipped it into a lake at the source of the Ganges, which bears the name of Bhunderpouch or "*Monkey's tail*" to this day. The Hindoos believe that every year a single monkey is sent by his fellows to take his station on the snowy peak of a mountain which rises from the sacred lake, and there keeps watch until he is relieved from his severe duty in the following season.

THE DOUC (*Semnopithecus Nemæus*).—The douc or Cochin China monkey is remarkable in this family for its vivid and varied colours. It has the face naked and yellowish; the top of the head, and the whole of the back and sides, grey; the shoulders and thighs, as well as the hands and feet, black; the arms white; and the legs deep chestnut. The face is surrounded by white whiskers, and the tail and a patch on the rump are also white, contrasting curiously with the darker fur in the vicinity.

This beautiful monkey, which attains a height of upwards of four feet, is a native of Cochin China, where it occurs in great abundance in the forests; but from the little commerce carried on with that country, scarcely anything is known of its habits, and specimens are even rare in our museums. It was long regarded as the type of a distinct genus, characterized by the absence of callosities, which, however, it is now found to possess. The error arose from the circumstance that Buffon, who first described the species, had only a badly-stuffed specimen, in which the skin had been allowed to shrink, so as to conceal the callosities.

THE BUDENG—(*Semnopithecus Maurus*)—an inhabitant of Java and Sumatra, presents a remarkable contrast to the preceding species in the uniform black colour of its long silky hair. The young animals are reddish-brown. A frill of upright hair runs across the forehead, and the cheeks are adorned with a pair of large pointed whiskers, directed backwards. This species is said by Dr. Horsfield to be exceedingly abundant in the forests of Java, where it lives in the trees, in troops of fifty or more. It would appear, from the statements of the same author, that it is hardly safe to approach them in the forests, not from any danger of an attack, but because the commotion produced in the troop by the sight of a man often causes them to break off the dead branches of the trees, which are then precipitated on the spectator. The natives often hunt them for the sake of their fur, when they kill them with sticks and stones. This species is also called *Lutung* or *Lotong*, especially in Sumatra; according to Dr. Horsfield its name in Java is *Budeng*, and another monkey is known as the *Lutung*, although the budeng is also sometimes called *Lutung Itam*, or Black Lutung, the second species being denominated *Lutung Mera*, or Red Lutung. The latter (*S. Pyrrhus*) is comparatively rare, and is a great favourite with the natives, who keep it as a pet about their houses. Of the other species of Semnopithecus very little is known; they are rather numerous, and inhabit the same countries as the preceding.

THE KAHAU, or PROBOSCIS MONKEY (*Nasalis Larvatus*),—Plate 1, fig. 3.—This curious monkey agrees very closely with the Semnopitheci in its general characters, but differs from them in the singular form of the nose, which, in the male especially, looks like an absurd caricature of that prominent and important member in the human countenance. It is principally from this circumstance that the kahau has been regarded as constituting a distinct genus.

The nose in the male forms a curved fleshy proboscis; in the female it is much smaller, and terminates in a sharp point, from which it slopes directly to the upper lip. The nostrils in both sexes are placed on the inferior surface. The tail, as in the preceding monkeys, is very long; the hair is of a reddish tawny or chestnut colour all over the body, paler in front; and the loins in the male are marked with pale spots. The face, which is naked, is described by some authors as of a bluish colour; but Mr. A. Adams states, that in a live female examined by him it was of a bright brick-dust red. The hair of the chin, neck, and shoulders is longer than that on the other parts of the body, producing somewhat the appearance of a mane.

The kahau is a large monkey, the adult males often measuring four feet and a half in height when in an erect posture. It is a native of Borneo, where it lives in numerous troops upon the trees in the neighbourhood of rivers, and is said to move amongst the branches in a more deliberate fashion than most other monkeys. According to the old Dutch naturalist, Wurmb, however, the kahau would appear to exhibit more activity in the morning and evening at least, when, he says, they may be seen "leaping with astonishing force and rapidity from one tree or branch to another, at the distance of fifteen or twenty feet." He adds that the natives will have it, that, when thus occupied, the monkeys hold their noses in their hands, doubtless from a fear lest so ornamental an appendage should meet with some injury; but this, he says, he has never seen. When disturbed, it emits a short, impatient cry, described by Mr. Adams as something "between a sneeze and a scream, like that of a spoilt and passionate child;" other accounts compare this cry to the word *kahau*, whence is derived the name usually applied to the animal. It would appear, however, that its true native name is *Banta-jan*. It is described as a fierce and violent animal.

The kahau is only known to inhabit the great island of Borneo, where the Dyaks assert that these monkeys are men who have retired into the woods to escape taxation. How they subsequently became ornamented with tails does not appear. The species is also said to occur in Sumatra, the peninsula of Malacca, and Cochin China. From the statement of M. Geoffroy St. Hilaire,—that the ambassadors sent by Tippoo Sahib to Paris, just before the French revolution of 1789, recognized the stuffed specimen in the museum there as an animal of their country to which they ascribed a high, moral, and intellectual character—it would appear, also, that this, or a similar species, should occur in Hindostan proper. None of these localities, however, rest upon any sufficient testimony; and in the case of Tippoo's ambassadors, it seems probable that they may either have seen specimens brought as captives from the far east, or that they may have confounded this monkey with the hoonuman.

THE GUEREZA (*Colobus Guereza*).—Although the majority of the African monkeys belong to a group presenting well-marked differences from the Indian species above described, there are, nevertheless, some of them which exhibit a close resemblance to the Semnopitheci, both in structure, character, and mode of life, and may be regarded as the African representatives of the Asiatic group which has hitherto occupied our attention. The stomach has the same sacculated structure; the dentition is identical, and the molar teeth are found to be worn down by use, indicating that the creatures live upon the leaves and buds of trees, rather than upon fruits; the cheek-pouches are wanting, the body and limbs are slender, and the tail long. The Colobi are, however, distinguished from their Indian relatives, and, indeed, from all other monkeys of the Old World, by a most important character, namely, the total absence or rudimentary condition of the thumbs on the anterior members; in most cases the metacarpal bone of the thumb is alone present, and in those species in which this is followed by a single small joint, the only external indication of a thumb is a mere tubercle, of not the least service in prehension.

The guereza is the only species of this group upon whose habits we have any information. It is about the size of a cat, and of a deep black colour, with the cheeks, throat, and sides of the neck white, and with a large quantity of long white hairs, growing from the shoulders, sides, and rump, and hanging down in such a manner as to conceal the whole lower part of the body. The extremity of the tail is, in like manner, concealed by long white hairs.

This beautiful monkey, which is a native of Abyssinia, was mentioned by the old traveller Ludolf, who supposes it to have been the *Callithrix* of the ancients, a conjecture which seems very probable from the description of that animal given by Pliny. Ludolf says that it is called *Foukes* in Ethiopic, and *Guereza* in the Amharic dialect, and these two names are given with some variation by later travellers.

Dr. Rüppell, who first accurately described the guereza, informs us that it resides in small families in the loftiest trees, and usually in the neighbourhood of some stream. It is restless and lively in its habits, but not noisy; its food consists of wild fruits, seeds, and insects; and, unlike the ordinary monkeys, it never commits any depredations upon the cultivated grounds. In allusion to its harmless nature, and to the constant persecution to which it is subject, for a reason which will be hereafter mentioned, Ludolf says that a curious rhyme is current in some parts of Abyssinia, which may be translated as follows:—

> "I give no man pain—
> I eat no man's grain—
> They hate me in vain!"

The same traveller notices the tenderness of constitution of this monkey, which is confirmed by other observers, from whose narratives it would appear that the guereza will not endure confinement, but pines to death in captivity in the course of a few days.

The fur of this animal is much prized in Abyssinia on account of its beauty; and in the provinces of Damot and Gojam, where the guerezas abound, they are destroyed in great numbers for the sake of their skins, which, according to Dr. Rüppell, fetch as much as five shillings each in the market of Gondar. Mr. Salt places the value rather lower, saying that they sell for about half a dollar. They are chiefly employed in ornamenting the shields of the native soldiers; and the distinguished traveller last quoted, states that every man in Tigré wears a piece of this skin as an ornament on his shield. The skins are also sometimes sewn together, when they form a beautiful covering for a couch, but their cost prevents their being put to this use by any but the chiefs.

Several other monkeys of this genus are found in the tropical regions of Africa, especially on the western coast, whence the skins of some long-haired black species are imported into Europe, and used in the manufacture of muffs. There is much uncertainty as to the number of species, about half a dozen having been described, which are considered by some authors as simple varieties of one or two. This is owing in a great measure to the imperfect condition of the skins which reach this country. They are highly prized by the Negroes, who make caps of them, and will pay from twenty to thirty shillings apiece for them; and as it is only the skin of the body that is valuable as a fur, the hunters never take the trouble of skinning the head and legs.

The great majority of the African monkeys belong to the group called *Guenons* by French authors, forming the genus CERCOPITHECUS of zoologists. These monkeys have the face somewhat produced into a muzzle, but rounded at the extremity; cheek-pouches are always present; the eyes are prominent, not shaded by projecting eyebrows; and the tail is long, usually longer than the body. They are distinguished from a nearly-allied group—that of the *Macaques*, all the species of which are inhabitants of tropical Asia—by the last molar in the lower jaw having only four tubercles on its surface; whilst in all the remaining monkeys and in the baboons, this molar exhibits one or two additional small tubercles at its posterior portion. In all these monkeys the canines of the upper jaw are greatly developed, especially in the males, in which they acquire a formidable length as compared with the size of the animal; and from their being acute at the point, and very sharp along the hinder edge, they constitute most dangerous weapons, which the old males of most species know well how to use.

Besides the presence of cheek-pouches, the Cercopitheci present another character of distinction from the Indian Semnopitheci and the African Colobi, which, although of secondary importance, and common to them and many of the macaques and baboons, it is still necessary to mention. This is the annulated nature of the fur, arising from the individual hairs not being of the same colour from the root to the tip, but marked with rings of different colours, by which means the fur acquires a minutely speckled appearance; and the general tint of the animal is usually quite different from any of the distinct colours which are to be found in its fur.

In their structure and form, as in their character, these animals may be regarded as the types of our notion of a monkey; they are nearly equally removed from the apes on the one hand, and from the baboons on the other. Unlike the mild and gentle Semnopitheci and Colobi, they are petulant, capricious, and often spiteful, especially when old; whilst on the other hand they are, for the most part, free from the sullenness and moroseness which are usually characteristic of the baboons. They live in the forests, each species usually confining itself to some particular district, where the animals live in large troops, under the chieftainship of the old males; and the inroads of one species or tribe upon the region over which another has arrogated the dominion to itself, are highly resented by the latter, of which the whole community immediately unites to repel the aggression. Even in confinement this party feeling is maintained; and it is not uncommon in large menageries, where numerous monkeys of different kinds are kept in the same cage, to see those of one species combine their powers to defend one of their brethren against the bullying of some larger occupant of their common prison. In their native forests, these monkeys keep at a distance from human habitations, and usually frequent the banks of streams. They feed principally upon fruits and seeds, but also eat the buds and young shoots of trees, and occasionally diversify this vegetable diet with a repast of birds' eggs or insects, although they appear to be less addicted to animal food than the baboons.

The genus Cercopithecus includes those monkeys of the Old World which are most commonly brought to Europe, and also those which have most frequently produced young ones in our menageries. The female, under these circumstances, carries the young one in her arms until it has acquired strength enough to cling firmly to her hair, when, having all her hands at liberty, she is able to spring and climb about with as much activity as if she had no burden. The male is sometimes, if not always, an exceedingly bad father, quarrelling with the female, and ill-treating the young one. M. Is. Geoffroy St. Hilaire, mentions, that in 1837, when a female of the *Grivet* (*C. Griseus*) had a young one in the Jardin des Plantes at Paris, the male was obliged to be removed, in consequence of his unnatural behaviour to his infant offspring; while, in the very next cage, several male baboons were to be seen surrounding two females with their young ones, caressing the two mothers with the most lively demonstrations of tenderness, pressing them in their arms, embracing them almost like human beings, and quarrelling amongst themselves for the pleasure of nursing the little ones, which, after passing from arm to arm, were faithfully returned, each to its own mother."

Of the numerous species of this genus known to naturalists, we can only mention a few. Amongst these—

THE TALAPOIN (*Cercopithecus Talapoin*) is the one which, in the gentleness of its disposition and the slenderness of its form, would appear to approach most closely to the preceding monkeys; it has been separated by Geoffroy as a distinct genus, on account of the large development of its brain, the shortness of its muzzle, and especially the small size of its hinder molars, of which those of the lower jaw have only three tubercles.

The talapoin is the smallest of the monkeys of the Old World. Its fur is of a greenish tint, with the lower surface of the body and the inside of the limbs greyish-white; the hairs of the forehead are raised, so as to form a sort of tuft; the whiskers are yellowish, and the face flesh-coloured, with the nose and ears dark-brown or black. It is a native of Western Africa, but is less commonly brought into Europe than many other species inhabiting the same locality, although its gentleness and intelligence render it one of the most interesting of the Old World monkeys. In captivity it is very lively and amusing.

THE MONE (*Cercopithecus Mona*) is a species nearly related to the talapoin, which it resembles in the elegance of its form, and in its intelligence. It is a little larger than the talapoin, but is still one of the smallest of the Simiadæ, and its colours are very beautiful. The head is of an olive-green colour, mixed with golden-yellow; the forehead is covered with whitish hairs, and on each side of the face is a large bushy whisker of a straw colour; the back and sides are brilliant chestnut, mottled with black; the legs and tail are black, speckled with grey, and on each hip, immediately in front of the root of the tail, is an oval spot of the purest white—a character which is peculiar to this species; the throat, the lower part of the body, and the inner surface of the limbs, are also pure white.

The mone inhabits the western coast of Africa, and is usually brought to Europe from Senegal. Its name of *Mona* is a sort of generic name for monkey in some parts of the south of Europe, and was applied to this species by Buffon, who also identified it with the *Cebus* of the ancients, although without sufficient reason. In confinement it exhibits a remarkable amount of amiability, being more docile and less petulant and capricious than most other monkeys, so that it may be allowed far more liberty, although the males not unfrequently change their character for the worse as they increase in age. M. F. Cuvier has published an interesting account of an individual of this species, which lived from its youth upwards in the menagerie at Paris, and preserved its gentleness even after it had arrived at maturity. This specimen exhibited wonderful address in getting at any object that pleased him; he would open cupboards by turning their keys, or undo knots, and had acquired an adroitness in pocket-picking that would have done credit to a pupil of Mr. Fagin, performing this operation with so much delicacy that his hand could not be felt, although the person whose pockets were under examination might be perfectly aware of what was going on.

THE DIANA MONKEY (*Cercopithecus Diana*) which is said to be called the *Roloway* on the Gold Coast, and *Exquima* in Congo, is a larger and stouter species than either of the preceding, but is still distinguished amongst the monkeys of this genus by the elegance of its form, and the gentleness and playfulness of its character. Its general colour is a mixture of black and grey, with the face, the hands, and the extremity of the tail deep black; down the back runs a broad band of a deep chestnut-red colour; on the forehead there is a white band, curved so as to form a very open crescent—a character which induced Linnæus to give the species the name of the goddess of the chase; and the whiskers and beard are also pure white. The latter appendage forms one of the most curious characters of this monkey; it is very long and pointed, resembling, as Mr. Ogilby says, "the formal cut of the peaked beard which we see in some old paintings about the time of Henry VIII.;" and the monkey appears to regard it as highly ornamental, taking great care to keep it trimmed and neat, and holding it in his hand when he is about to drink, to prevent it from coming in contact with the water. Mr. Ogilby says that the first time he observed this strange action, the ludicrous effect of the creature's solicitude about his beard made him laugh outright; the monkey, after looking up for a moment as if in astonishment at this sudden explosion, appeared all at once to discover its cause, and no doubt regarding it as a personal insult, flew at the offender most viciously, and was only prevented by the shortness of his chain from inflicting a severe and summary punishment upon him.

As a general rule, however, the diana monkey is exceedingly good-tempered, and very lively and playful. A most interesting account of a specimen of this species was communicated by Mrs. Bowdich to *Loudon's Magazine of Natural History*, vol. ii. This monkey, which had received the name of Jack, belonged to the cook of the ship in which Mrs. Bowdich returned from Africa. Teasing was one of his principal accomplishments, and he seems to have brought the art to a great state of perfection. He would pull off the men's caps and throw them into the sea, a habit which is said to be common in nautical monkeys; he would knock over the parrot's cage for the pleasure of drinking the water as it trickled along the deck, steal the tea out of the sailors' mugs, or abstract the pieces of biscuit which the men had put between the bars of the grate to toast, and carry off the carpenter's tools. But his favourite amusement consisted in riding the pigs, in which he was a great adept. "Whenever the pigs were let out to take a run on deck," says Mrs. Bowdich, "he took his station behind a cask, whence he leaped on the back of one of his steeds as it passed. Of course the speed was increased, and the nails he stuck in to keep himself on produced a squeaking; but Jack was never thrown, and became so fond of the exercise that he was obliged to be shut up whenever the pigs were at liberty." Several smaller monkeys were on board the ship, and of these he was very jealous, going so far as actually to throw two of them into the sea. On a third he exercised his spite in a most ludicrous fashion. The sailors had been painting the ship's side with a streak of white, and on going down to dinner left their paint and brushes on deck. This excellent opportunity was not lost upon Jack; he called a little black monkey to him, and when the poor little beast came and crouched at the feet of his superior, the latter seized him by the nape of the neck, dipped the brush into the paint, and immediately covered his victim with white from head to foot. This absurd spectacle caused Mrs. Bowdich and the steersman, who had both been watching his proceedings, to burst into a laugh, upon which Jack dropped the whitened monkey and scampered up into the rigging, whilst the unhappy little subject of this practical joke began licking himself, and was only preserved from being poisoned by a thorough washing with turpentine. During this operation, the author of the mischief was peeping down through the bars of the maintop, with evident enjoyment of the commotion that he had occasioned. Fear of punishment, however, kept him aloft for three days, until hunger compelled him to come down, when he dropped suddenly into Mrs. Bowdich's lap, as if to seek for protection. The skin of the diana monkey forms a beautiful fur, and is frequently used for that purpose.

THE WHITE-NOSED MONKEYS (*Cercopithecus Nictitans* and *Petaurista*), which are also nearly related to the mone, and inhabit the same countries, are distinguished by having a large white spot upon the nose. The best known of these is the Lesser White-nosed monkey (*C. Petaurista*), which is one of the quietest and most playful species of the group; and from its familiarity and amusing habits is always a great favourite with the visitors to our menageries.

THE CALLITHRIX (*Cercopithecus Sabœus*), so called because Buffon supposed it to be identical with the Callithrix of the ancients, belongs to a section of the genus in which the form is more robust, and the character generally far less amiable, than in the preceding species. It is also called the Green monkey, and the Cape de Verd monkey, the latter name indicating one of its dwelling-places; it also occurs in Senegal. It is a handsome species, about the size of a large cat; the fur of the back and sides is of an olive-green colour, mixed with brown, that of the belly is yellow, and the whiskers are yellowish. It is very hardy, and is consequently common in menageries, where its restless playfulness renders it attractive; but its temper becomes uncertain as it grows older, and the adult males are often very spiteful.

THE GRIVET (*Cercopithecus Griseus*) is a nearly-allied, but smaller species, which is also frequently imported into Europe. It is a native of Nubia and of several provinces of Abyssinia, where it is a favourite with the inhabitants, who often keep specimens in their houses. The grivet was also well known to the ancient Egyptians, and is often represented on their monuments.

THE PATAS (*Cercopithecus Ruber*), an inhabitant of Senegal on the west coast of Africa, is one of the monkeys most commonly imported into Europe. It is about the size of the callithrix, and of a general reddish fawn colour, with the lower part of the body and the inner surface of the limbs pale grey. Across the forehead there is a blackish band, and the extremity of the nose is covered with very short black hairs. In confinement the patas resembles the two preceding species in its character, being very lively and playful, but at the same time so capricious in its temper that any approach to familiarity with it is attended with danger. In a state of nature, according to the old French traveller Brue, the patas possesses a great share of curiosity, coming down from the tops of the trees to the lower branches to examine the boats passing beneath them; but when the first novelty wore off, the monkeys, says he, "became more confident, and began to pelt us with rotten branches and other missiles, not always of the most delicate description." This compliment being returned by the sailors with their guns, by which some of the monkeys were killed and others wounded, they did not allow themselves at first to be intimidated, but renewed the assault with great determination, until finally perceiving that the odds were against them, they scampered nimbly out of range of the guns, and afterwards contemplated the boats from a safer distance.

THE NISNAS (*C. Pyrrhonotus*), is a species very nearly allied to the patas, with which it was formerly confounded. It is, however, a stouter animal, and presents several distinctive characters, especially the whiteness of a portion of the nose. The nisnas is a native of Abyssinia and Nubia; it was well known to the ancient Egyptians, and is often represented in their sculptures. It is also supposed to be the *cebus* of the Greek writers on natural history.

The group of the Macaques, already referred to as distinguished from the Cercopitheci by the presence of an additional (fifth) tubercle on the hindmost molar teeth in the lower jaw, nevertheless presents a close resemblance to the preceding group in its general characters. In fact, the characters of the species of these groups shade so gradually into each other—the Cercopitheci becoming insensibly macaque-like, and the macaques baboon-like in their general structure—that some writers have proposed the abolition of the group of the macaques altogether, by uniting the more monkey-like macaques with the Cercopitheci, and the more baboon-like species with the baboons. At the same time, as the macaques, with but two or three exceptions, are all inhabitants of Asia, where they well represent both the Cercopitheci and baboons of Africa, it seems desirable to retain the group on account of its convenience in regard to zoological geography.

The macaques are, in general, of a more robust form than the other monkeys; the muzzle is prominent, but rounded off at the extremity, and the tail is very variable in length, being sometimes as long as in many Cercopitheci, sometimes reduced to a mere tubercle, and in two species altogether wanting. In their general habits they resemble the Cercopitheci, but their evil passions acquire a strength proportioned to their usually larger size and greater physical power; and although they are less disgusting and ferocious than the baboons, they are far more so than the other monkeys.

THE SOOTY MANGABEY, or WHITE-EYELID MONKEY (*Cercocebus Fuliginosus*). We have already stated, that although the macaques are strictly speaking an Asiatic group, they have a few representatives elsewhere. Amongst these are the mangabeys or white-eyelid monkeys which inhabit Africa, and most closely resemble the common monkeys of that continent in their general form, in the length of the tail, and in their habits. The mangabeys are, however, distinguished from the ordinary monkeys and from the other macaques, by a peculiarity in the structure of the hands—all the fingers both of the fore and hind hands being united by webs which extend at least as far as the first joint, whilst between the first and second fingers of the hinder hands, the web reaches nearly to the tip. They are also characterized by the dead white colour of the upper eyelids, which gives them a singular aspect when brought into view by those perpetual blinkings in which all monkeys are fond of indulging.

The sooty mangabey, which is the commonest species, is of a sooty grey colour on all the upper parts of the body, the tail and the outer surface of the limbs; the chin and throat, and the lower parts of the body are brownish ash colour. This monkey is a native of the west coast of Africa, but nothing is known of its habits in a state of nature. In captivity it is familiar and gentle, exceedingly active and full of grimace, throwing itself into such ludicrous attitudes that, as M. F. Cuvier observes, "it might be supposed to be provided with a greater number of joints than other monkeys," or tumbling and dancing in an absurd fashion to attract the attention of the visitors, from whom it hopes to obtain a reward for its agility. Mr. Ogilby mentions that a "specimen in the menagerie of the Zoological Society was very fond of being caressed, and would examine the hands of his friends with the greatest gentleness and gravity, trying to pick out the little hairs, and all the while expressing his satisfaction by smacking his lips, and uttering a low suppressed grunt." This habit appears to be a favourite one with the species, as many specimens exhibit it.

Two other species of these monkeys are known—the COLLARED MANGABEY (*Cercocebus Collaris*), and the WHITE-CROWNED MANGABEY (*C. Æthiops*); they are both said to inhabit the west coast of Africa.

THE BONNET MONKEY (*Macacus Sinicus*), the *Toque* of some authors, was called the *Bonnet Chinois* by Buffon, from an erroneous notion that it was a native of China; it is now known to come from the Malabar and Coromandel coasts, and probably inhabits the whole southern extremity of the peninsula of Hindostan. It also lives in a wild state in the Mauritius, but has been introduced into that island since its occupation by Europeans.

The bonnet monkey is a species frequently brought to Europe for exhibition; it is about the size of a large cat, of a greenish-dun colour on the upper parts and greyish below, and has a long tail. The whole of the face is naked, wrinkled, and of a dingy flesh colour; but the most striking character of the species is to be found in the arrangement of the hair of the crown, which is long and dark-coloured, and instead of standing erect, spreads in all directions like rays proceeding from a common centre, lying upon the surface of the head in the same way as the hair of a scalp wig. It is from this character that the animal has received the name of the bonnet monkey. A somewhat similar disposition of the hair occurs in a nearly allied species, the *Crowned Monkey (Macacus Pileatus)*, but this is of a reddish-brown colour, and the hair of the head is nearly erect. In its native country the bonnet monkey meets with an amount of veneration almost equal to that shown in Bengal to the hoonuman (see p. 27); although very destructive in the gardens and fields, it is forbidden to kill them, and the natives assemble round any person guilty of this offence, and give him no peace until he has paid for a sumptuous funeral for his victim. Such at least is the account given by Buchanan of the state of matters in Mysore, which, in all probability, relates to this monkey; and that traveller adds, that the proprietors of gardens used to hire men of a particular class, who captured the monkeys and squirrels (which, it would appear, are equally sacred) in nets, and then conveyed them to some distant village; but as everybody resorted to the same means of getting rid of such troublesome neighbours, the gardeners soon found that the monkey-catchers were the only people who benefited by these proceedings, and accordingly gave them up.

In confinement, the bonnet monkey is a most amusing fellow when young, as all his actions are performed with an amount of gravity which is exceedingly ludicrous. Of all the species usually kept in our menageries, the bonnet monkeys exhibit the most striking external marks of mutual affection. When two or three are kept together they are constantly to be seen hugging or nursing each other, or carefully searching in the fur of their companions for the fleas and other vermin which doubtless harbour there in sufficient abundance to render their destruction a matter of gratification. At all events this appears to be the feeling of the monkeys, who make it an affair of mutual advantage; for whilst one fellow exhibits the most exemplary patience, lying at full length, and submitting to have every part of his fur investigated by the sharp nails and sharper eyes of his companion—the latter rewards himself for his trouble by immediately devouring any of his friend's troublesome guests that may come under his fingers. Where a specimen of this monkey has none of its own species to contract an intimacy with, it will content itself with some other animal, and a kitten is not unfrequently given to it as a companion. Under these circumstances, as Mr. Ogilby remarks, "nothing can exceed the ridiculous caricature of humanity which it presents—petting, nursing, and hugging the unfortunate kitten, at the imminent risk of choking it, with all the gravity and fondness" of a child similarly employed. When adult, however, the deportment of the bonnet monkey becomes entirely changed; instead of the playful good temper of the young animals, the old males exhibit a morose, sullen, and spiteful disposition, which renders it dangerous to attempt any familiarities with them, and the aspect of the animal changes at the same time, and acquires a ferocity which accords but too well with his temper.

THE MACAQUE (*Macacus Cynomolgus*) is another long-tailed species which is also frequently brought to Europe. It is a larger and more robust species than the bonnet monkey, which it resembles in most of its structural characters, and in its disposition. The colour of the upper parts of the body and the outer surface of the limbs is greenish-brown, the lower surface and the inside of the limbs are greyish-white. The tail, when not injured, is about as long as the body; but the macaque has a curious habit of gnawing the end of his tail, and it is a very common circumstance to see specimens with this member considerably abbreviated, most probably in this way. The hair of the crown of the head usually forms a sort of ridge, or crest, running from back to front, and appearing as though it had all been brushed up towards the middle. A specimen which exhibited this peculiarity was described by Buffon under the name of the *Aigrette.*

The macaque is far more widely distributed than the bonnet monkey, being found not only on the continent of India, but also on several of the large islands, especially Java, Sumatra, Borneo, and Celebes. According to Dr. Horsfield, it is the commonest monkey in the forests of Java, where it is a great favourite with the natives, who constantly domesticate it and keep it in their stables, under the impression that its society is advantageous to the horses. In the European menageries the macaque appears to thrive; it supports the severity of our winters better than most other monkeys, and has been several times known to breed in Europe. It is remarkable that, under these circumstances the female has generally deserted her offspring, although other nearly-allied species have not only bred in confinement, but have tended their young with the greatest care. The habits of this animal in captivity are similar to those of the bonnet monkey, but the old males become even more ferocious and spiteful.

THE WANDEROO (*Macacus Silenus*) is one of those species of macaques in which the tail is only about a third of the length of the body. It measures from three feet to three feet and a half in height, and is of a robust form; its hair is of a black or blackish colour, as is also the naked skin of its face and paws, but its head is surrounded by a long thick mane of greyish hair, resembling an enormous wig falling down upon the shoulders, in the style of that remarkable head-dress which is still thought to confer such dignity upon our judges, and perhaps justly, for between this ornament and the habitual gravity of its countenance, the wanderoo acquires a singular air of wisdom and importance, which, in the monkey at any rate, is exceedingly ludicrous. Its tail is tufted at the extremity.

The name of *Wanderoo*, commonly given to this monkey, is said to be its ordinary denomination in Ceylon, of which island, and the adjacent coasts of continental India, it is an inhabitant. It is said, also, by some writers, to advance far towards the north at certain seasons of the year, and sometimes even to ascend the Himalayas nearly to the region of perpetual snow. According to Father Vincent Maria, a Carmelite monk, this monkey would appear to occupy quite an aristocratic position amongst the other quadrumanous inhabitants of the Malabar coast. The old missionary tells us that "the other monkeys pay such profound respect to this species, that they humiliate themselves before him, as if capable of appreciating his superiority and pre-eminence," and the magnificence of his wig seems even to produce an impression on the human inhabitants of Malabar, for the worthy father adds, that "the princes and great lords hold him in much estimation, because he is endowed above every other with gravity, capacity, and the appearance of wisdom. He is easily trained to the performance of a variety of ceremonies, grimaces, and affected courtesies, all which he accomplishes in so serious a manner, and to such perfection, that it is a most wonderful thing to see them acted with so much exactness by an irrational animal." Mr. Ogilby is probably in the right when he attributes the submission of the other monkeys to the wanderoo, rather to his physical than to his moral superiority, and the behaviour of several specimens which have from time to time been exhibited in this country has proved that the wanderoo is not superior to his congeners in sagacity. Robert Knox, another old traveller, tells us, that in Ceylon this monkey does little mischief, but lives in the woods, feeding on the leaves and buds of trees.

THE BRUH (*Macacus Nemestrinus*), described by Buffon under the name of the *Maimon*, is of a more robust form than the wanderoo, and has the tail much shorter, slender, nearly naked, and slightly curled, which has given origin to the name of the *Pig-tailed Monkey*, originally applied to this species by Edwards. The bruh is of a blackish-brown colour on the back, becoming lighter beneath and on the limbs; its face is flesh-coloured. It is an inhabitant of Sumatra and Borneo, and is described as being more docile and intelligent than its nearest allies; but this amiability of character would seem to disappear with age, although even old specimens are said to exhibit less ferocity and sullenness than the other large macaques. According to Sir Stamford Raffles, the natives of Sumatra are fond of domesticating the bruh, whose docility they turn to good account. They train it to climb the cocoa-nut trees for the purpose of picking the fruit, and it is said to show great discrimination in selecting the ripe nuts, of which, moreover, it picks no more than its master requires.

THE BHUNDER (*Macacus Rhesus*) is a species very nearly related to the bruh, with which it was indeed confounded by Cuvier. It is, however, furnished with a rather longer tail; and this appendage, instead of being slender and naked, is thick and well covered with hair; the upper surface of the body is of a greenish-grey colour, the individual hairs being annulated with light dun and dark brown; the lower surface and the inside of the limbs are light grey, and the callosities are bright red. The skin is remarkably loose and flaccid, hanging in folds even in the young animals; and this peculiarity, which occurs, although to a somewhat less extent, also in the bruh, enables these monkeys to be fattened to such a degree as to exhibit an enormous corpulence.

The bhunder is a native of continental India, where it occurs abundantly in Bengal, and is also found in Assam, Nepal, and Simla. The hoonuman is the only other monkey which lives in these provinces, and the bhunder appears to share with this sacred species in the respect of the natives. Captain Williamson tells us that in many places revenues are allotted for feeding whole tribes of bhunders under the charge of a fakeer, or other mendicant priest, who ekes out the regular revenues attached to his office by charitable contributions levied upon travellers principally by the monkeys, who show themselves most accomplished beggars. They never molest any one, unless some cause of offence is given; but then they bite severely, and a trifling circumstance may produce the necessary irritation. Mr. Johnson also confirms these statements, and mentions that at a place called Bindrabun, "more than a hundred gardens are well cultivated with all kinds of fruit, solely for the support of these animals, which are kept and maintained by religious endowments from rich natives." The same writer tells us on good authority, "that in the district of Cooch Behar, a very large tract of land is actually considered by the inhabitants to belong to a tribe of monkeys which inhabit the neighbouring hills, and when the natives cut their different kinds of grain, they always leave about a tenth part piled in heaps for the monkeys. As soon as their portion is marked out, they come down from the hills in a large body and carry off all that is allotted for them, stowing it under and between the rocks in such a manner as to prevent vermin from destroying it. On this grain they chiefly live; and the natives assert that if they were not to have their due proportion, in another year they would not allow a single grain to become ripe, but would destroy it while green. It does not appear whether this singular and primitive payment of tithes has been settled by mutual agreement between the natives and the monkeys; but in other places, where no such arrangement is described as existing, the monkeys come freely in search of their dues into the houses, and carry off whatever they prefer with perfect impunity. In fact, the destruction of one of these animals is looked upon as a heinous crime by the Hindoos; and the writer last quoted mentions that two young officers who had shot at a bhunder, were pelted with sticks and other missiles by the fakeers and other inhabitants of Bindrabun, where the supposed outrage took place, until the elephant on which they rode was driven into the river, where both the young men, as well as the driver of the elephant, were drowned. Nevertheless, the respect thus manifested for the monkeys does not prevent the jugglers who swarm in India from teaching these animals numerous tricks; and, according to Captain Williamson, "it is very diverting to see these little mimics counterfeiting the gait and motions of various professions, and especially corroborating by their actions the deluge of flattery which the jugglers pour forth in praise of everything relating to the English character. Their antics are so excellently just on these occasions, that many human professors of the mimic art might, without the smallest disparagement, take a lesson from these diminutive imitators."

The bhunder is one of the few species of Simiadæ which have produced young in our menageries, and, under these circumstances, the female exhibits a wonderful degree of affection for her offspring. In a case recorded at great length by M. F. Cuvier, the young animal continued for the first fortnight of its existence firmly clinging to the hair of its mother, with its mouth constantly applied to her nipple, only changing its position occasionally in order to cross over to the other side, but constantly turning its eyes to watch everything that occurred in its vicinity. At the end of a fortnight the little creature detached itself from its mother, and then, from the very first, exhibited an address and precision in its movements which could hardly have been anticipated. Still the mother watched it with anxious care, always ready to assist it in any difficulty into which it might fall during its gambols, and clasping it in her arms whenever she thought it was threatened with any danger. At the end of six weeks, however, when the young one was ready for more solid nutriment, this otherwise affectionate mother displayed a singular amount of selfish greediness, driving her offspring away from the front of the cage whenever their food was put in, so that it was only by stealth that the poor little beast contrived to secure a share of what was going.

Several other species of macaques inhabit the continent of Asia and its islands; but amongst these we shall only mention the URSINE MACAQUE (*M. Ursinus*), and the RED-FACED MACAQUE (*M. Speciosus*), in which the tail is reduced to a mere tubercle, and the BLACK MACAQUE (*Macacus Niger*), in which there is no trace of that appendage. The second of these species is remarkable as being the only monkey inhabiting Japan; and the third presents some peculiar characters, which have caused it to be raised to the rank of a distinct genus, under the name of *Cynopithecus*.

THE MAGOT (*Inuus Sylvanus*), or BARBARY APE, as it is frequently called, is the last species of the group of macaques to which we shall refer; it is remarkable as being the only monkey found in Europe. It differs from the rest of the macaques in having the posterior tubercle of the hindmost molar in the lower jaw divided into three parts by two little furrows, and from nearly all of them by the total absence of a tail.

The magot, when full grown, stands between three and four feet in height, and is of a robust form. The general colour of its fur is a yellowish olive-green, pale or greyish beneath; the face is of a dingy flesh-colour, much wrinkled, and marked with irregular brown spots; and the hairs surrounding the face are of a dirty grey. It usually goes on all fours, and appears to prefer rocky and mountainous districts for its habitation, where this quadruped mode of progression is the most practicable one. In its character it closely resembles the other macaques, being lively, intelligent, and docile when young, but becoming morose and intractable with increasing years. The vivacity and playfulness of the young and half-grown animals, have always rendered them great favourites with the itinerant showmen of Europe, and the magot has been well known in this way from time immemorial. He has, however, another and still more important claim upon our attention: during the long series of years when the dissection of the human body was strictly prohibited, the anatomists of Europe derived all their notions of anatomy from the structure of this animal. Galen's description of the anatomy of man was almost entirely drawn from his dissections of the magot; and many years afterwards, when Vesalius published his great and valuable work, "De corporis humani fabrica," the surgeons of the old school refused to accept the new views therein brought forward, and adhered resolutely to Galen in all points when there was a difference between the statements of the rival anatomists. Some of the most distinguished physicians of the sixteenth century actually wrote treatises in support of the old notions; and it was not until Camper, two centuries later, proved that Galen's descriptions applied only to the magot, that we may consider the question to have been finally settled.

The chief home of the magot is in the mountainous parts of Northern Africa, in Algeria, and Morocco, where these animals reside in the forests in large troops, and are said to attack and drive away the beasts of prey which intrude upon their domains, although no doubt they often fall a prey to the leopard, and some of the smaller cats which abound in Northern Africa, and which, by the facility with which they climb trees, may easily steal upon them unawares during the night. Their food in a state of nature, according to M. Desfontaines, consists of "pine-cones, chestnuts, figs, melons, pistachio nuts, and vegetables, which they carry off from the gardens of the Arabs, notwithstanding all the pains they take to exclude these mischievous animals. While they are committing their thefts, two or three mount to the summits of the trees and of the highest rocks to keep watch, and as soon as these sentinels see any one or hear a noise, they utter a cry of warning, and immediately the whole troop takes to flight, carrying off whatever they have been able to lay their hands on." M. Desfontaines adds, that "in the wild state, they generally bring forth only a single young one, which, almost as soon as it is born, mounts on the back of its mother, embraces her neck with its arms, and is thus transported in safety from place to place; sometimes, however, it remains firmly attached to the breast."

The origin of the colony of this species, which still lives upon the rock of Gibraltar under the special protection of the English garrison, has frequently been a subject of discussion; some naturalists thinking that the species must have been imported into the south of Spain, as some of its Eastern allies have been into the Mauritius. It would appear, however, that the extreme southern part of the Spanish peninsula harbours a considerable number of terrestrial animals, which are otherwise peculiar to the opposite shores of Africa; and, according to some authors, the magot itself occurs in a wild state upon other mountains of Andalusia, and even of Granada. Ancient writers also are silent with regard to the occurrence of their *Pithecus*, which was undoubtedly the present species, in any other part of Europe; although Procopius, a Greek writer of the sixth century of the Christian era, mentions man-like apes inhabiting Corsica. In the absence of all positive evidence, one way or the other, we can only suppose that the magot, with the other African forms of animals which occur with him in Southern Europe, may have extended his range into the latter region at a period when the two continents were united. Even then it would be curious that the European representatives of the species should confine themselves to a bare rock at the most southern point of the peninsula, as if anxious still to be within sight of the shores which undoubtedly constitute their true home, but from which they are for ever excluded. This, however, may perhaps be explicable upon the supposition, that important changes of climate may have taken place in Spain since the disruption of the continents at the Pillars of Hercules.

The group of the *Baboons* at which we now arrive, and which closes the series of Old World monkeys, resembles the macaques in most of its characters, differing principally in the form of the face, which, in the baboons, is produced into a snout and more or less truncated, or, as it were, cut off at the extremity. They have small eyes, placed closer together than in any of the preceding groups of monkeys; the hindmost molars in the lower jaw are furnished with one or two accessory tubercles as in the macaques; and the tail, which is usually short, is placed very high up on the rump.

The baboons are all of considerable size, larger than the other monkeys, but usually smaller than the true apes. They are of a robust form, with stout powerful limbs, upon which they usually go upon all fours; they are, in fact, the most animal of the Simiadæ. Their jaws are enormously powerful, and armed with immense canine teeth, with which they are able to inflict very severe wounds upon their adversaries. They usually take up their abode amongst the rocks, and are confined to the African continent, in all parts of which some species are found. One species also occurs in Arabia. They are ferocious and disgusting in their habits, and during the breeding season the posterior callosities, which are of large size and generally of a bright red colour, become so turgid and conspicuous, as to give the creatures a most repulsive aspect. In confinement, even the females seem to delight in exposing these disgusting features to the gaze of the spectators, whilst the males usually exhibit the lasciviousness of their nature in such an odious light, that they can rarely be exposed freely to the public. In many cases they have been known to notice women amongst the spectators before their cages, sometimes even selecting the youngest and handsomest for this questionable compliment, and evincing their preference by unmistakeable gestures; so that there can be little doubt, that had they the opportunity, they would resort to violence for the gratification of their passions.

THE MANDRILL (*Papio Mormon*), Plate 2, fig. 4. The mandrill, the largest and most powerful of the baboons, belongs to a genus in which the tail is very short, forming a small naked process which stands up perpendicularly to the spinal column. The head of this baboon is of large size, a circumstance which is due principally to the enormous development of the facial bones; in the males, especially, these bones form a long muzzle, on the sides of which are a pair of large bony protuberances; the upper canines are of immense size; the lower jaw is enormously powerful and armed with sharp canine teeth; the surface of the skull exhibits strong ridges for the attachment of the muscles; and no one who looks at the entire skull of a mandrill, can doubt for a moment that the creature possessing such formidable weapons and such powerful means of setting them in motion, would be as terrible an antagonist as almost any beast of prey.

The adult male sometimes attains a height of upwards of five feet when standing upright. The general colour of the fur on the back and sides is a light olive-brown, and on the lower parts of the body a silvery grey. On the forehead and crown of the head the hair is directed upwards, giving a curious appearance to the head; the face is naked, and the protuberant sides of the nose are strongly ridged and marked with bright red, light blue, and purple. The callosities are large, and of a bright red colour. In the females and young males, the muzzle is shorter and less protuberant than in the old males, and of a uniform blue colour.

The native country of this formidable animal is the western coast of Africa, especially in the district of Guinea, where it appears to have been often confounded with the chimpanzee in the stories related by the Negroes to travellers. It is known to the natives of different districts by a variety of names, amongst which *Smitten*, *Choras*, *Boggo*, and *Barris* are recorded by authors; the latter name is the one given to the gorilla by De Laval (see p. 17), and we have already stated that the name of *Drill*, now commonly applied to the following species, and which evidently forms part of the name under which the present animal is known, really belongs to the chimpanzee. Considering the vicious character of the mandrill, we may, perhaps, suppose that many of the narratives of travellers, with regard to women being carried off into the woods by monkeys, apply rather to this species than to the chimpanzee, although both of them are charged with this crime. The mandrills are also described as associating in large troops, and driving away other wild animals, including even the elephants, from the districts of the forest in which they choose to take up their quarters, whilst their human neighbours are afraid to pass through the woods in which they reside, except in large companies and well armed. In a state of nature the mandrills live principally upon fruits, although, like the other baboons, they doubtless often devour small animals, and they are said sometimes to make a descent upon the negro villages, and plunder them of everything eatable. In captivity they eat almost anything, and usually acquire a strong taste for intoxicating liquors. A fine specimen which was exhibited many years ago at Exeter Change, and which had retained his youthful tractability to a later period than is usual with the male baboons, was in the habit of drinking his pot of porter daily, accompanying this indulgence with a pipe, which he smoked with great gravity.

When thus engaged he would sit in his chair with his pot of porter in one hand, and no doubt he would have been as indignant as little Tony Weller, had he been offered a pint instead of his customary allowance. This mandrill bore the appropriate name of *Happy Jerry*, and his reputation was so wide-spread that he was actually honoured with an invitation to Windsor Castle from his Majesty George IV.

THE DRILL (*Papio leucophœus*) is another species of short-tailed baboon very nearly allied to the mandrill, and, like it, an inhabitant of the Guinea coast. It is rather smaller than the preceding species; its fur is of a more greenish colour; the sides of the muzzle are less protuberant, and the skin of the face is entirely black. It was originally described as a distinct species by Pennant, under the name of the *Wood Baboon*; but little or nothing is yet known of its habits in a state of nature, although in these it probably resembles the mandrill.

THE CHACMA (*Cynocephalus porcarius*) belongs to another genus of baboons, in which the tail is of moderate length. The chacma is the largest species of this genus, equalling a large mastiff in size and form, exceeding it in robustness and strength. It is of an olive-black on the back, with the sides and belly paler; the whiskers are greyish and the face brown. It is an inhabitant of the Cape of Good Hope, where it lives in the mountains amongst the rocks in troops of three or four hundred together. Travellers through the passes of the Cape Mountains describe the noise made by the baboons, when they see the loaded waggons intruding upon their territory, as something terrific; and should the travellers outspan for the night in the vicinity of their habitations, the yells and howlings of the baboons are kept up all night, so as effectually to scare sleep from the intruders' eyelids, and make them long for the first dawn of day to recommence their toilsome march. Sometimes, however, it would appear that the baboons take matters more quietly, sitting peaceably on the summits of the rocks and gazing down upon the train of waggons; should they be within reach of the rifles of the travellers they scramble away immediately, climbing up the faces of nearly perpendicular rocks, by the help of certain creeping plants which, in many places, form a network over the rocks, and from the use to which the baboons put them, are called by the boors *Monkeys' ladders*. Their movements under such circumstances are said to be indescribably amusing, but they cannot always be observed in safety; for the baboons sometimes attack travellers by throwing stones down upon them.

The food of the chacma, like that of the other baboons, consists partly of fruits and roots, and partly of animal substances, such as insects, lizards, and the eggs of birds. In search of vegetable aliments, the troops often descend into the cultivated districts, where they do great damage. From this circumstance, coupled with their ferocity and other evil qualities, the chacmas are regarded with much antipathy by the Cape boors, and this feeling appears even to be shared by the dogs; for we are told that there is no other animal which they attack so readily, or with so much determination. Such are the strength and ferocity of the chacma, however, that some of the dogs generally pay dearly for their temerity, and the boors would almost prefer setting their dogs upon a lion, to letting them go in pursuit of one of these animals. Even the leopard, which inhabits the same districts as this powerful baboon, and feeds principally upon the females and young males of the chacma, often meets with a disappointment when he ventures upon an old male.

Notwithstanding these bad qualities the young chacmas are often domesticated at the Cape, when they are said to show great docility, and to fulfil the important office of keeping guard and giving notice of the approach of a stranger as well as or better than a dog. They are also trained to perform some other useful duties. Sometimes a smith will be seen with a chacma attending to his fire, or a peasant committing the guidance of his oxen to one of these animals; but in whatever way they may be employed, they require to be always under the eye of the master. They are also noted for the sagacity with which they reject any unwholesome food, so that a Hottentot will never touch anything that has been refused by a chacma. This renders it exceedingly difficult to poison them, and M. Pucheran mentions a case in which one of these animals actually abstained for ten days from touching some poisoned food which had been prepared to kill him. From the account given by M. Le Vaillant of one of these baboons which was in his possession in Africa, they would appear to be good-tempered, amusing, and even affectionate; but these good qualities in all probability wear off in course of time, as the adult specimens which have been kept in menageries in Europe, have exhibited all the ferocity and other disgusting qualities of their congeners.

THE DERRIAS (*Cynocephalus Hamadryas*). Several species of baboons are found abundantly in the north-eastern part of the African continent, in Nubia, Abyssinia, and even in the mountains of Arabia. Amongst these the most celebrated is the derrias, a large species, standing about four feet in height when erect, which is remarkable from its having the whole fore part of the body, as far as the loins, covered with long shaggy hair, whilst that of the hinder quarters is short; so that the creature has not unaptly been compared to a clipped French poodle. In its habits the derrias closely resembles the preceding species.

By some writers this is considered to be the ape *Thoth*, so commonly represented upon Egyptian monuments, usually in a sitting posture, but variously employed. He was the emblem of Hermes (Thoth) the inventor of letters and of the art of writing, and Horapollon, an ancient author, relates that whenever one of these baboons was brought to the temples, he was met by a priest who presented him with tablets and pen and ink, to ascertain whether he really belonged to the family of those who understood writing.* Subsequently the thoth appears to have become the symbol of the supreme judge of the souls of men; and in this capacity he is frequently represented with a pair of scales, in which the good and bad actions of those before him are to be weighed. Ehrenberg thinks, with some probability, that the singular head-dress which is so frequently represented on Egyptian monuments, was an imitation of the remarkable hairy covering of this sacred monkey.

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* This may remind our readers of the story in the "Thousand and One Nights," in which a prince, metamorphosed into an ape, discovers his human quality by writing.

THE COMMON BABOON (*Cynocephalus Papio*), the last species to which we shall refer, is a native of the western coast of Africa, where it appears to be exceedingly abundant. Of all the baboons it is the one which is most frequently brought to this country, and its good temper, familiarity, and curious habits when young, render it a great favourite with the visitors to menageries. As it increases in age, however, it acquires the same repulsive habits as its allies, although perhaps in a somewhat less degree, and in some cases the adult males have been known to retain much of their youthful docility. It also exhibits great intelligence.

The general colour of this baboon is reddish-brown; the whiskers are light fawn colour; the face nearly black, and the callosities reddish-violet. It is one of those Simiadæ which support the climate of Europe with least inconvenience, and it has frequently bred in our menageries. The adults, and even the males, exhibit much attachment to the young animals, nursing them with great tenderness whilst they are very young, and treating them afterwards with far more kindness than is usually shown by monkeys in captivity towards their offspring.

With the baboons we terminate the long series of interesting species which constitute the family *Simiadæ*, and at the same time the first section of the great tribe of SIMIÆ or monkeys. In these, as already stated (p. 14), the nostrils are placed close together and separated only by a narrow partition; whilst in the second section of the Simiæ the nose is broad and flat and the nostrils separated by a wide interval. We have already adverted to the remarkable zoological distribution of these two nearly-related groups of animals; the first section, *Catarrhine*, being restricted to the eastern hemisphere, while the *Platyrrhine*, or *Flat-nosed* monkeys are as exclusively confined to the New World. In the Old World, as we have seen, the monkeys are almost exclusively inhabitants of tropical regions, and this is still more decidedly the case in America, where these animals are confined to the forests of the hottest parts of the southern continent.

Although the species of American monkeys are exceedingly numerous, they present no such variety of form and habits as their eastern brethren, and we shall therefore be able, by selecting a few of the more striking species, to give the reader a good idea of the whole group. They are all of small or medium size, and arboreal in their habits; all are destitute of cheek-pouches and callosities, which are possessed by the majority of the Old World species; their food is of a mixed animal and vegetable nature; and in their dispositions they are usually good-tempered, docile, and intelligent. Nevertheless, with all these characters in common, the American monkeys present certain structural peculiarities, by which they may be divided into two distinct families.

FAMILY II.—CEBIDÆ.

The first and most important of these families is that of the Cebidæ, which is at once distinguished from all the other monkeys by a most important character, namely, the presence of four additional molars—there being six of these teeth in each side of each jaw; so that, the number and distribution of the other teeth remaining the same, there are in all thirty-six teeth in this family, whilst the rest of the monkeys have only thirty-two. From the second family of American monkeys the Cebidæ further differ in having the fingers all furnished with flat nails. With but one or two exceptions they have very long tails, and in most cases these organs are prehensile at the tip, so that these creatures are, as it were, provided with a fifth hand, which is of the greatest service to them in their rapid and agile movements amongst the branches of the trees.

THE RED HOWLING MONKEY (*Mycetes Seniculus*), Plate 2, fig. 5. The Howlers, or howling monkeys (*Mycetes*), are the largest and most robust of the American monkeys, appearing in some respects to represent in the New Continent the orangs and chimpanzees of the Old World. Their jaws are large and powerful, and armed with strong teeth, the structure of which indicates their food to be principally of a vegetable nature. Their colours are usually reddish or brown, and they are furnished with a long and well-furred tail, which has the tip naked on the lower surface, and is strongly prehensile.

The most remarkable peculiarity of these animals, and the one to which their name of howlers refers, consists in the fearful noise which they produce every morning and evening, and often during the night, which, according to Humboldt and Azara, may be heard at a distance of more than a mile. Azara compares the noise "to the creaking of a great number of ungreased carts;" and Waterton states that, on hearing the howlers in the primæval forests of Guiana, "you would suppose that half the wild beasts of the forest were collecting for the work of carnage; now it is the tremendous roar of the jaguar, as he springs on his prey; now it changes to his deep-toned growlings, as he is pressed on all sides by superior force; and now you hear his last dying moan beneath a mortal wound." It is still a question whether these terrible howlings are produced by a single monkey at a time, or by a general chorus of a whole tribe; but the Indians fully believe that one of the number commences the concert. Marcgrave, in his "Natural History of Brazil," published in 1648, gives us, evidently from the reports of the Indians, a very circumstantial account of the proceedings of the howlers. He says that every morning and evening these monkeys assemble in the woods, and that one of them then perches himself in the highest place he can reach, and makes a sign to the others to sit around him. He then commences his discourse, with a voice so loud, that, according to our author, it might be supposed that the whole of them were howling together, although they sit in the most decorous manner in perfect silence, listening to the vociferation of the self-elected preacher. When the latter ceases, however, he makes another sign with his hand, when the assembly indemnifies itself for the previous restraint by bursting at once into clamour. Marcgrave adds, that they again become silent at a sign from the chief, who then resumes his howling for a time. When he ceases the assembly breaks up. This tale evidently contains great exaggerations; but it is quite possible that one of the monkeys may commence the howling, and the reports of more trustworthy travellers prove that a single individual is quite capable of producing a most unbearable noise.

The structure by which these creatures are enabled to give utterance to sounds apparently so out of all proportion to their size, is of a very curious nature. The two sides or branches of the lower jaw are enormously enlarged, so that they form a pair of bony plates descending vertically from the skull, and, when seen from the side, appear fully as large as the latter. Between these is a rounded bony case, consisting of the central part of the hyoid or tongue-bone, inflated into a thin hollow ball. This receives a membranous pouch, which communicates with the larynx, and it is by the reverberation of the voice in the hollow space thus formed, that it acquires the tremendous power to which we have just referred.

In their habits the howlers are dull and morose; their movements are slow; and they live in small parties under the guidance of a chief, who is always an old male. The latter is said to place himself in an elevated situation, to guard against the approach of danger to the little band under his care; but, notwithstanding this precaution, the animals may be easily approached, although it would appear to be by no means safe to stand under the trees occupied by them, as a sudden fright sometimes produces very disagreeable effects. In passing from branch to branch, the howlers, in common with many other American monkeys, make use of their tail as a fifth hand; and so great is its prehensile power, that, even after the animal is killed, it not unfrequently remains suspended by the tail. In some places they are eaten by the Indians, after being roasted on a spit; but the resemblance of the body of one of these monkeys, when skinned, to that of a child, always causes Europeans to regard such food with a feeling of repugnance. The female produces only one at a birth, which she carries on her back.

The Red Howler (*Mycetes Seniculus*), called the *Alouate* by Buffon, and the *Royal Monkey*, or *King of the Monkeys*, by the South American Indians, is a native of Guiana, where it inhabits only the woods in the lower grounds. Its length, to the root of the tail, is usually twenty-two inches, and the tail is of about the same length. The general colour of the hair is a fine red, brighter on the head and limbs; the face is naked and black. Several other species are found in different parts of the South American continent. Amongst these, the most abundant and most widely distributed appears to be the *Brown Howler* (*M. Ursinus*), which occurs in several provinces of Brazil. It is the monkey whose habits furnished Marcgrave with the foundation for the story given above, and this has obtained for it the name of the Preacher monkey.

THE HORNED MONKEY (*Cebus fatuellus*), Plate 2, fig. 7. The *Sapajous*, *Sajous*, or *Capuchins* (*Cebus*), also called *Weepers*, from their plaintive cry, include a considerable number of American monkeys. In their general form they resemble the howlers, but are always of smaller stature and less robust form. Their heads are short and rounded, and their tails, although prehensile, are destitute of the naked space at the extremity, which gives that organ, in the howlers and spider-monkeys, such a firm grasp of any object round which it may be coiled. Their hands are furnished with perfect thumbs, both on the fore and hind limbs.

In nearly all the species the face is bordered by a profusion of long hair, which gives the little creatures a most formidably-whiskered appearance, and the top of the head is often similarly provided. In the horned monkey the hair of this part forms two strong black tufts, which give the creature the appearance of being furnished with horns. Its general colour is chestnut red, with the chest and belly bright red, and the limbs and tail brown. It is an inhabitant of Brazil and Guiana.

These monkeys live in troops in the boundless forests of the South American continent, where they feed upon fruits, seeds, insects, and corn, and also upon small birds and their eggs. In their turn they furnish a considerable portion of the food of the small carnivorous quadrupeds, such as the ocelots, which abound in the American forests, and which are very arboreal in their habits. The sajous are of a gentle disposition, and easily tamed, when they may be taught a number of amusing tricks. They are frequently brought to Europe, not only for exhibition in menageries, but also to be carried about by itinerant musicians, who teach them to go through a variety of evolutions, such as firing off a small gun, and sweeping up the platform on which they are exhibited with a miniature broom. Their intelligence is very considerable: they will break a nut which is too strong for their teeth by beating it between two stones; and a specimen which was living some years ago in the menagerie at Paris, would light a lucifer match by rubbing it upon the wall of his cage, and then hold it in his fingers and watch it burning without the least fear. Rengger, in his "Natural History of the Mammalia of Paraguay," mentions several circumstances illustrative of the high degree of intelligence possessed by these monkeys. They peel oranges, and tear the wings and legs off the larger insects before eating them. When a living bird is given to them, they first bite a hole in the skull, through which they extract the brain, then pluck off the feathers, tear the bird limb from limb, and finally gnaw the flesh off the separate bones. On giving an egg to a young one for the first time, he would break it very clumsily, and make a shocking mess with it; but in a short time he learnt by experience to break the end gently against a solid body, pick off the pieces, and then suck out the contents without losing a drop. This mode of sucking eggs is also adopted by the spider-monkeys, and some others. But perhaps the most remarkable instance of intelligence presented by the sajous is the following:—Rengger had been in the habit of giving his specimens small quantities of sugar twisted up in paper. One day he inclosed living wasps in the papers, and the unfortunate monkeys, opening their prizes incautiously, were severely stung. But this was never afterwards the case; for, becoming wise by experience, they always held the papers up to their ears before opening them.

The species most frequently brought to Europe is the BROWN SAJOU, or WEEPER MONKEY (*Cebus Apella*), which is exceedingly abundant in Guiana, and also occurs in Brazil and other parts of South America. It measures about fourteen inches to the root of the tail, which is between two and three inches longer than the body. It is of a reddish-brown colour, darker on the back, head, limbs, and tail, but with the upper part of the arms tawny or greyish-yellow.

THE COAITA (*Ateles Paniscus*), Plate 2, fig. 6. The Coaita is one of the most widely distributed of the well-known American monkeys to which the name of *Spider monkeys* has been given, in allusion to the great length and slenderness of their limbs. It is found over the greater part of the South American continent, from Brazil and Guiana in the West, to Peru in the East. In common with the other species of its genus (*Ateles*), it is totally destitute of thumbs on the anterior members, which thus consist only of four fingers, the only trace of the thumb being an imperfect metacarpal bone, completely concealed within the skin. The tail, like the limbs, is very long, and exhibits a piece of naked callous skin on the lower surface at the tip; this, coupled with the great muscular power of the tail, renders it, like that of the howlers, a most powerful prehensile organ, and the animals use it freely as a fifth hand in almost all the transactions of life. The agility of movement displayed by these curious creatures when springing freely about in their arboreal home, is in a great degree due to this fifth hand; grasping a branch with it, they swing to and fro in the air, until gaining a sufficient impetus, they launch themselves towards some other object; and thus with the aid of the long limbs, pass over great spaces with inconceivable rapidity. Even when confined in menageries they exhibit astonishing agility. We are told also by Dampier and Dacosta, that when these monkeys want to pass a river, or to get from one tree to another at a little distance, without descending to the ground, they form themselves into a sort of chain, each clinging to the other by his tail; the whole then swing to and fro, until the lowest individual at the free end of the chain contrives to get hold of the object to be attained, when he draws up the rest, and the whole pass over.

The coaita measures about two feet in length to the root of the tail, and is covered with long black hair, except upon the face which is naked and brown. They live in the forests in troops, but frequently descend in search of nourishment to the plantations, especially the Indian-corn fields, which they plunder to an extent that is anything but agreeable to the owners. Their booty is carried off to be eaten at leisure in the woods, and here again the tail comes into play; for an old negro told Mr. Gardner, that he had often seen the coaita making off with three ears of Indian corn, one in its mouth, one under its arm, and the third in its tail. The coaita, and the other spider monkeys, also feed to a certain extent upon animal substances, such as insects, molluscs, birds' eggs, and even small fishes; and those which reside in the vicinity of the sea are said sometimes to descend to the coast, and regale themselves with marine luxuries, especially oysters, which they are ingenious enough to break between two stones. They are said also to adopt the same course with nuts which are too hard for their teeth to crack, and their general intelligence is very high, certainly higher than that of any other American monkeys, and inferior to that of few of the Old World.

In captivity the coaita is very gentle, and soon becomes tame. It is impatient of cold, and rather melancholy in its aspect, but exceedingly amusing from its agile gambols. An interesting account of a tame coaita will be found in Mr. Gardner's "Travels in the interior of Brazil." It became a favourite of his whole party, and especially cultivated the friendship of a large mastiff which accompanied them on their journey. On the march, Jerry, as the monkey was called, always rode on the back of his canine friend, but he was not at all particular as to whether his face was towards the head or tail of the dog, except in going down hill, when he always turned his face forwards; and to prevent himself from being ignominiously slipped over the head of his charger, made use of his tail as a crupper, by twisting its prehensile extremity round the root of the dog's tail.

THE SQUIRREL MONKEY (*Callithrix sciureus*), Plate 3, fig. 8. The Squirrel monkey, *Saimiri* or *Tee Tee*, is undoubtedly the prettiest, the most amiable, and probably the most intelligent of the whole tribe. The length of its head and body is only about ten inches; its tail, which is scarcely prehensile, measures thirteen and a half; its general colour is olive-grey, with the arms and legs reddish or orange-coloured; and the face is bare and whitish, with the nose black. Its eyes are large, soft, and lustrous, giving the little creature an expression of intelligence, heightened by the form of its head, in which the skull is of very large size as compared with the facial bones. The skull, with its inclosed brain, is in fact larger in proportion to the size of the animal than that of any other monkey, so that, if we may take the mere size of the brain as a measure of intelligence, we may easily account for the superiority of this interesting little creature.

The squirrel monkey lives in the forests of Guiana and Brazil, feeding principally upon fruits and insects. Its tail is of little use to it in its arboreal gambols, but it appears to employ it in keeping itself warm, by winding it round its body. In captivity it is gentle and affectionate, and one of the most interesting of the monkey tribe. Humboldt has given some interesting details with regard to individuals in his possession. When he spoke to them for some time, they listened with the most marked attention, but soon raised their hands to his lips, as if to catch the words as they escaped. They recognized the objects represented in engravings, even when not coloured; and when the figures of insects and fruits were shown to them, they stretched out their hands towards the paper, and endeavoured to seize their simulated food.

THE DOUROUCOULI (*Nyctipithecus trivirgatus*). The large eyes of the delicate little squirrel monkeys to which we have just referred, indicate probably that their period of activity is to a certain extent nocturnal; but in the douroucouli, this character is carried to a far greater extent, and this animal and its allies are known to sleep through the day, and to roam about at night in search of their food. Their eyes, like those of the cats, are luminous in the dark; their voice is very strong, and, according to Humboldt, resembles that of the jaguar. It seems probable, indeed, from a statement made by that author in his "Aspects of Nature," that the concert of fearful noises heard during the night in the forests of tropical America, and usually attributed to the howling monkeys alone, is due to the combined efforts of many different vocalists.

The douroucouli shelters itself in the holes of large trees, and according to Humboldt, lives in pairs, and not in troops, like most other monkeys. Spix, however, says that he has seen them going about in bands. The tail is long, but not prehensile, and the animal winds it round its body when in repose. The ears are almost entirely concealed by the long hairs on the sides of the head; the colour of the fur on the upper parts of the body is grey; the lower parts are orange, and this colour also appears on the sides of the neck. The forehead exhibits three black lines, diverging backwards; and the tail is yellowish-grey, with the tip black. The length of the head and body is about ten inches, and that of the tail eleven. The douroucouli feeds principally on insects, and also on small birds, which it easily surprises when they are asleep.

FAMILY III.—HAPALIDÆ.

The Marmozets (*Hapalidæ*), forming the third family of the Quadrumana, and the second of the American monkeys, are distinguished from the Cebidæ, to which they are in other respects very closely allied by the absence of the additional molar tooth, which, in the latter, occurs on each side in each jaw. Thus the total number of their teeth and that of the different kinds of teeth becomes the same as in man and the higher Quadrumana of the Old World. The tubercles of the molars are also more acute than in the Cebidæ, indicating that the marmozets are more addicted to an animal diet, and, in fact, a great part of the nourishment of these creatures consists of insects, eggs of birds, and even small birds themselves, when these come within reach of the carnivorous little monkeys. Their tails are long and well-furred, but never prehensile.

The marmozets are all of small size, rarely exceeding that of a squirrel; their heads are small and rounded; their ears usually provided with tufts of hair; the thumbs of the anterior hands are scarcely opposable, but those of the hinder pair are completely so, and these are furnished with flat nails whilst all the rest of the fingers bear claws. In every particular of their organization these monkeys show themselves to be inferior to the rest of the great group of Simiæ, and to approach more closely to the ordinary mammals, whilst the almost complete absence of convolutions on the surface of the brain would seem to indicate a degree of intelligence far below that, not only of the other Quadrumana, but even of the majority of the placental Mammalia. In this respect, indeed, the marmozets appear to approach the squirrels, with which they also have some other analogies; they are incapable of the education which most of the other Simiæ and some of the Cebidæ in particular, may be brought to receive, and their instinctive faculties are very highly developed. The extent of their intelligence will be seen from the particulars recorded by Audouin of the behaviour of two marmozets observed by him. In a picture they could recognize their own likeness, and those of flies, locusts, and beetles, the latter of which they endeavoured to seize with great avidity. The picture of a cat, on the other hand, and that of a wasp, caused them to shrink with terror, and when occupied in catching the flies which entered their cage, which they did with incredible dexterity, the appearance of a wasp attracted by a piece of sugar fixed in the bars, drove them at once to take refuge at the bottom of their cage. Astonished at this instinctive dread of an insect which they could never have seen before, Audouin took a wasp and brought it near the two marmozets, when they immediately hid their heads between their fore hands and closed their eyes. But as soon as he substituted for the wasp, a grasshopper, a beetle, or some other harmless insect, they darted upon it greedily and devoured it with the greatest gusto. Sugar and sweet fruits also constituted favourite articles of food with them, and they possessed the art of sucking eggs in great perfection. They would not eat flesh; but when a small living bird was given to them, they would seize upon and kill it, then open its skull and devour the brain, at the same time licking up any blood that might flow; they would also sometimes eat the bill, the tendons of the feet, and some other parts, but always avoided the flesh. Mr. A. R. Wallace during his voyage up the Amazon had an opportunity of observing many similar habits in specimens of several species of this family, which he kept in confinement.

M. Audouin states that his marmozets recognized those who had the care of them, but this is opposed to the observations of most other naturalists, and must have been due to peculiar conditions in the individuals observed by the great French entomologist.

In their native regions, the luxuriant forests of South America, these elegant little monkeys live amongst the trees in small troops, displaying, amongst the branches, an agility almost as great as that of the beautiful little inhabitant of our own woods—the squirrel. Their activity, however, is nocturnal. They produce as many as three young ones at a birth, which is an additional indication of their approach to the lower Mammalia; for the rest of the Quadrumana, and even the Cheiroptera, usually produce only a single young one; and, as if to show this more clearly, it sometimes happens that when they breed in captivity, the mother will destroy one or more of her offspring, a circumstance which occurs still more frequently with the true Carnivora, and some of the Rodentia. Their young are born with their eyes open.

From the foregoing account of the intellectual qualifications of the marmozets it is evident, that the high esteem in which they were formerly held as pets must have been due almost exclusively to the elegance of their form, and the agility of their movements; but whatever may have been their peculiar claims to such an honour, there is no doubt that in the sixteenth, seventeenth, and eighteenth centuries they were the favourite companions of the most fashionable ladies of Europe, and probably had even more tenderness lavished upon them than is bestowed upon the lap-dogs of the present day. We find the word marmozet applied to young children as a term of endearment by several writers of the last century. A remarkable indication of the early prevalence of the taste for having marmozets as pets, rendered the more striking by the absurd anachronism involved in it, is furnished by the fact that Guido has introduced one of these animals into his picture of the Abduction of Helen.

Of this group, which includes only a single genus, the species appear to be rather numerous, about thirty having been already described, whilst, from the accounts given by recent travellers, there can be little doubt that many more remain to be discovered. As, however, they are all very similar, both in structure and habits, we shall only refer to a few of the best known species.

THE COMMON MARMOZET (*Jacchus vulgaris*), Plate 3, fig. 9, a native of Brazil, is of an ash colour, with the rump barred with brown, and the tail variegated with darker and lighter rings; the head and back of the neck are of a reddish-brown colour, and on the sides of the head, both before and behind the ears, are numerous long hairs of an ash colour. It measures about eight inches in length, whilst its tail is nearly eleven inches long.

THE BLACK-TUFTED MARMOZET (*J. penicillatus*), also a native of Brazil, closely resembles the preceding, but has the head and the tufts of long hair about the ears black; the latter character also occurs in the White-headed Marmozet (*J. leucocephalus*), in which, however, the whole front of the head is white, whilst the general colour of the fur is reddish.

THE MARIKINA (*J. Rosalia*), Plate 3. fig. 10, belongs to a section of the marmozets which has been regarded by M. Geoffroy Saint-Hilaire as forming a distinct genus (*Midas*), characterized by having the lower incisor teeth short and broad, whilst in the rest of the family they are long and narrow. It is a beautiful little creature of a golden yellow colour, with the head and shoulders covered with long hair, forming a sort of mane, which has obtained it the name of the *Lion monkey* from some authors. It occurs in several parts of South America, especially in Guiana, Brazil, and Peru, and, from the beauty of its silky fur, its gaiety, and gentleness, it was formerly one of the greatest favourites of all the marmozets. The species was first described by Brisson, from a living specimen in the possession of Madame de Pompadour.

THE PINCHE (*J. Œdipus*), another pretty little species inhabiting the same countries as the marikina, has the long hairs confined to the forehead and the crown of the head, where they form a sort of crest or tuft of a white colour, the general colour of the fur being a tawny brown, with the lower parts white, the face black, the ears reddish, and the tail red at the base and black at the tip.

The marmozets close the great and interesting group of the Simiæ, which, as we have seen, includes those species which approach most nearly to humanity in their structure, and exceed all other animals in natural intelligence, whilst the last members of the series cannot be regarded as greatly superior, in either respect, to creatures which the necessities of classification compel us to place at a great distance below them.

In the second group of the Quadrumana, that of the *Prosimiæ* or *Lemurs*, the general animal character of the species is equally if not more strongly marked than in the marmozets, and yet every species exhibits the quadrumanous character in perfection, the thumbs of all the four extremities being opposable. They are distinguished from the Simiæ, as already stated (p. 15), by the presence of a claw upon the first finger of the hinder hands, although the thumbs and the remainder of the fingers on both pairs of hands are almost invariably furnished with flat nails. The incisor teeth are variable in number, being frequently unequal in the two jaws; the canines are always present, and usually of considerable size, and the molars, of which there are either five or six on each side, are often acutely tubercular, indicating an insect diet.

The whole of the Prosimiæ are inhabitants of the Old World, and the majority of them are confined to the large island of Madagascar, where they are almost the only representatives of their order.

FAMILY IV.—LEMURIDÆ.

Of the species peculiar to the remarkable island of Madagascar, by far the greater number belong to the family of the Lemuridæ or true Lemurs. In these the general form of the body greatly resembles that of a cat set rather high upon its legs; the thumbs are all opposable, and the first finger of the forehands well developed; the muzzle is elongated and pointed something like that of a fox, from which circumstance the name of Fox-nosed monkeys has frequently been applied to the lemurs. The eyes are large and placed on the front of the head, the body is clothed with a thick soft fur, and the tail is long and full.

But the most positive distinctive character of the family consists in the number of the teeth, of which there are thirty-six, namely, four incisors, two canines, and six molars in each jaw. The upper incisors usually form two pairs, separated by a small space, and placed almost perpendicularly in the jaw; the lower ones are much longer, and project almost in a horizontal direction; the upper canines are much longer than the lower ones, and the salient tubercles of the molars indicate frugivorous habits.

These beautiful animals, of which numerous species, varying in size from that of a marten to that of a large cat or fox, occur in Madagascar, are nocturnal in their habits, coming forth in troops from their hiding-places at sundown to exhibit their wonderful activity amongst the branches of the trees, through which they sweep with a swiftness and silence that induced Linnæus to compare the species known to him to lemures or ghosts. Their food, as already remarked, consists to a great extent of fruits, but they also feed freely on insects and, like all the lower Quadrumana, have a great liking for eggs and young birds, which they may seize with great ease during their nocturnal expeditions through the forest. The females produce only a single young one at a birth, and attend to this with the greatest tenderness. At first they carry their offspring about in their arms, the little creature aiding its mother's efforts by clinging to her breast; but as the young lemur increases in size, it coils itself round her middle, and is thus carried about.

In confinement the lemurs are lively and playful, and the elegance of their forms and gracefulness of their actions render them most pleasing objects in our menageries, where, notwithstanding the tropical tenderness of their constitution, they have been known to live for many years, and even to breed. They exhibit less intelligence than the higher Quadrumana, but at the same time are destitute of the ferocity which often characterizes the latter as they increase in years. In general the lemurs are very gentle and harmless, fond of licking the hands of their visitors, and testify their contentment by a curious purring noise. According to the observations of M. F. Cuvier upon the mongous, the claw of the first finger of the hinder hands is frequently introduced into the ear and kept there some time, for what purpose does not appear; the use of the projecting incisors of the lower jaw seems to be to act as a sort of comb in cleaning the fur, which the animals are very fond of doing, not unfrequently performing this good office for each other.

THE RING-TAILED LEMUR (*Lemur Catta*), or Macaco, Plate 3, fig. 11, is one of the most elegant, and, at the same time, one of the best-known species of this family. It is about the size of a large cat, and its general colour is a delicate ashy grey; the sides of the head and face, the throat, chest, and belly, are white; and the long bushy tail is beautifully marked with broad rings of black and white. The form of the head in this species is perhaps more elegant than in any other lemur, and the vivacity and intelligence of its appearance are heightened by its white, pointed, and erect ears. In its manners also it is usually the most amiable and playful of all the lemurs, and appears to feel more affection than any of them for its master.

THE MONGOUS (*Lemur Mongoz*), is another species which is frequently brought to Europe, and indeed appears to be one of the most abundant in its native country. It is a little larger than the ring-tailed lemur, and its body is entirely clothed with a thick coat of tawny woolly hair. The sides of the face are ornamented with a pair of orange whiskers, the top of the head is black in the male, grey in the female, and the tip of the tail is also black. In speaking of the agility of this species M. F. Cuvier mentions that an individual in his possession was able to spring from the ground to the branch of a tree, at a height of at least ten feet.

The only other species of the genus *Lemur* to which we shall refer is the Pied Lemur (*L. Macaco*), which is remarkable for the distribution of its colours, consisting in large irregular patches of black and white. The tail and hands are entirely black, as are also the face and muzzle; a large black patch surrounds the shoulders and neck, and a still larger one occupies nearly the whole of the back, leaving only a comparatively narrow white band between it and the patch on the shoulders. This is the most usual arrangement of the black and white in the pied lemur; but it varies considerably, and specimens have been seen in which only the tail, the hands, and the muzzle were black. This species appears to be of a fiercer character than most of its congeners; some French travellers declare it to be as ferocious and cruel as a tiger, and M. F. Cuvier records an instance of a pied lemur which had lived for some time on good terms with a mongous having turned upon his companion the night after a change had been made in their abode, and utterly destroyed him.

Besides these true lemurs the forests of Madagascar nourish several other species belonging to this family, which have been regarded as belonging to distinct genera. Most of them belong to the genus *Cheirogaleus*, and the most important characters by which they are distinguished from the rest of the lemurs consist in the greater roundness of the head, the comparative shortness of the muzzle, and the larger size of the eyes. The latter character would indicate a more decidedly nocturnal activity than prevails even among the lemurs.

THE CHEIROGALEUS MILII, one of the few species of this group of the habits of which we know anything, and at the same time one of the largest of them, measures about fourteen inches in length, exclusive of the tail, which is rather longer than the body; it is covered with a thick silky fur of a tawny-grey colour on all the upper parts of the body, and white beneath. Its legs are very much shorter than in the ordinary lemurs. A specimen in the menagerie of Paris passed the whole day sleeping in a nest which it made for itself with hay, and the whole night in active movement. Its agility was so great that it could spring to a height of six or eight feet. It fed upon fruits, bread, and biscuits. The *Cheirogaleus Murinus*, described long since by Brown as the *Little Macauco*, is the smallest of the Lemuridæ, its body measuring only about six inches in length; it was described by Buffon in his manuscripts under the name of the Madagascar rat.

Family V.—LICHANOTIDÆ.

The preceding are not, however, the only quadrumanous inhabitants of Madagascar. The forests of that remarkable and still imperfectly-explored island, nourish another family of these animals, regarded by some writers as standing in the same relation to the lemurs as the anthropoid apes to the ordinary monkeys. These are the Indris, which are distinguished from the preceding by the presence of only thirty teeth. The anterior teeth in the lower jaw are, however, placed almost horizontally as in the lemurs.

THE INDRI (*Indris Brevicaudatus*), Plate 3, fig. 12, is exceedingly remarkable in its form, and also deserves notice from its being the largest known species of the entire group of the Prosimiæ or lemurine Quadrumana. When in an erect position the indri measures upwards of three feet in height. Its tail is exceedingly short, indeed almost rudimentary, and its hind legs very long—circumstances which render it the most manlike of all the lemurs. Its fur is very soft, long, and thick. Its general colour is black, with the throat and buttocks whitish. In its nature the indri is described as being very gentle, and, although not remarkable for intelligence, it is said to be so far susceptible of education that the natives of Madagascar, who honour it with the appellation of the *Man of the woods*, sometimes train it to hunt, probably for birds.

If the information that we possess upon the habits of the preceding species be scanty enough, we know still less with regard to the other members of this family, which indeed are very few in number. They differ from the indri in having the tail, which in that animal is so greatly abbreviated, well developed and furred, and also in some particulars of their dentition upon which we need not dwell.

FAMILY. VI.—NYCTICEBIDÆ.

The animals of this family, which includes the greater part of the lemurine forms found out of Madagascar, are distinguished from the preceding families by the more acutely tuberculate form of their molar teeth, which must be regarded as indicative of their insectivorous habits, and from those of the following family by their having, like the lemurs, a curved claw only on the first finger of the hinder hands. In the number and arrangement of their teeth they agree with the lemurs. They are strictly nocturnal animals, and, like most other animals of similar habits, have the eyes very large. The species are found in India and Africa.

THE BENGAL LORI (*Loris gracilis*), Plate 4, fig. 13, as indicated by its name, is an Indian species. It occurs in Bengal, Assam, Silhet, and the Malayan peninsula, and also in the island of Ceylon. The lori measures about a foot in length, and is of a greyish fulvous colour, with the lower surface of the body whitish, and a white band running down between the eyes, and surrounding the nose. It has a rounded head, with small ears and a short pointed nose. Its body and limbs are slender, the first fingers of the hands are short, and the tail is altogether wanting. Its fur is very thick and soft. The habits of the loris are strictly nocturnal. They reside in large forests, usually in mountainous districts, and pass the days sleeping in the holes of trees. At sunset they come forth, and move slowly about amongst the branches, seeking their food, which consists partly of fruits and the tender leaves of trees, and partly of insects, small birds, and mice. When on the ground their long slender limbs seem unable to support them, and they move, as described by M. F. Cuvier, in a manner somewhat resembling that of a very young puppy. Hence many writers have compared them with the sloths, and it is remarkable that they exhibit an arrangement of the arteries supplying the anterior limbs somewhat resembling that which prevails in those singular creatures. M. Gervais justly compares the slow and cautious movements of the loris to the semiparalytic gait of the chameleon.

In their nature the loris are gentle and inoffensive, and not destitute of intelligence, as will be seen from the following extracts from an interesting account given by Sir William Jones, the celebrated oriental scholar, of a specimen which lived for some time in his possession. "To me," says Sir William, "who not only constantly fed him, but bathed him twice a week in water accommodated to the seasons, and whom he clearly distinguished from others, he was at all times grateful; but when I disturbed him in winter, he was usually indignant, and seemed to reproach me with the uneasiness which he felt, though no possible precautions had been omitted to keep him in a proper degree of warmth. At all times he was pleased at being stroked on the head and throat, and frequently suffered me to touch his extremely sharp teeth; but at all times his temper was quick, and when he was unseasonably disturbed, he expressed a little resentment by an obscure murmur, or a greater degree of displeasure by a peevish cry, especially in winter, when he was often as fierce on being much importuned as any beast of the woods. From half-an-hour after sunrise to half-an-hour before sunset, he slept without intermission, rolled up like a hedgehog,* and as soon as he awoke he began to prepare himself for the labours of his approaching day, licking and dressing himself like a cat. He was then ready for a slight breakfast, after which he commonly took a short nap; but when the sun was quite set, he recovered all his vivacity. His ordinary food was the sweet fruit of this country. Milk he lapped eagerly, but was contented with plain water. In general he was not voracious, but never appeared satiated with grasshoppers, and passed the whole night whilst the hot season lasted in prowling for them. When a grasshopper or any insect alighted within his reach, his eyes, which he fixed upon his prey, glowed with uncommon fire, and having drawn himself back to spring on it with greater force, he seized the victim with both his fore paws, but held it in one of them while he devoured it."

Another species of lori (*L. tardigradus*), is found in some of the islands of the eastern archipelago, such as Java, Sumatra, and Borneo. It is rather smaller than the preceding species, and has a rudimentary tail, from which and other characters it has been regarded by some writers as forming the type of a distinct genus (*Nycticebus*). The Javanese lori has also been described as a distinct species.

THE POTTO (*Perodicticus Potto*) is the first African species of this family to which we shall refer. It is distinguished from all the rest of the Quadrumana by the rudimentary form of the first or index finger of the forehands, which is reduced to a mere tubercle furnished with a little claw. The potto is a thick-set animal, with short limbs and a long tail. Its size is about that of a small cat. Its ears are of moderate size. Its general colour is a reddish-brown, with the extremity of the tail black. M. Van der Hœven mentions, that in two specimens observed by him, "the spinous processes of the last five cervical and of the first two dorsal vertebræ are long, and pierce through the hairy integument of the back, with a weak horny covering." The potto is a native of the forests of the coast of Guinea, especially about Sierra Leone. Like the lori, which it resembles much in its general characters, it is a nocturnal animal, slow in its motions, feeding partly upon fruits and tender leaves, and partly upon insects and other animal matters.

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* The individual described by F. Cuvier is said by him to have slept sitting in a crouching posture.

THE SENEGAL GALAGO (*Galago senegalensis*), Plate 4, fig. 14.—The galagos, which constitute the remainder of this family, are elegant squirrel-like creatures, with rounded heads, large eyes, large membranous ears, and long tails. They differ from the potto in the elongation of the tarsal portion of the foot, and in the greater development of the first finger of the hands. In their dentition and most of their other characters they agree with the preceding species. Like these they are nocturnal animals, living amongst the branches of the forests, where they prey upon small birds and insects. Fruits also constitute a portion of their nourishment.

The Senegal Galago, which is the best known species, is an elegant little creature rather larger than a squirrel, of a grey colour, with a reddish tinge on some parts, and with the lower surface paler or whitish. It inhabits a considerable portion of the African continent, occurring in Senegal, Caffraria, Abyssinia, and Mozambique. It was first discovered in the first-mentioned locality by the celebrated Adanson, who describes its habits as intermediate between those of the monkeys and squirrels. It appears from the statements of the great French voyager and of later observers, that the galagos principally inhabit the great forests of acacias which furnish the gum-arabic of commerce, and that the Moors who bring them down from their native haunts give them the name of *Gum animals*, and declare that they feed upon that substance. It appears, indeed, that they will eat gum when offered to them; but they show a very decided preference for insect food, those which have been observed in captivity being always on the watch for insects, exhibiting considerable excitement when they only hear the sounds produced by these animals, and seizing upon any unlucky victim that may come within their reach with the greatest avidity. In their native haunts they display great agility upon the trees, amongst the branches of which they are always sporting at night, springing suddenly upon their insect prey with a velocity greatly aided by the length of their hinder limbs. They nestle in holes of the trunks of trees, which they line with soft beds of grass and herbage for the reception of their young.

Several other species of galago have been described —all from the African continent. The largest is the *G. crassicaudatus*, an inhabitant of Mozambique and Port Natal, which is about the size of a rabbit.

FAMILY VII.—TARSIIDÆ.

The galagos, as already stated, are distinguished from the other members of their family by the great length of their tarsus, and the large size of their ears; in these respects they show an evident approach to the little creatures which form the present family, and which might, perhaps, be included in the same group with them without much violence to a natural system. The tarsiers, however, exhibit so many peculiar characters, that although only a single species of the group is well-known, this may well be regarded as the type of a distinct family. The characters by which this is distinguished, independently of the elongation of the tarsus, are the presence of only two incisor teeth in the lower jaw, the uniformity of position of the four upper incisors, which do not stand in two pairs, and the existence of claws upon both the first and second fingers of the hinder hands.

THE TARSIER (*Tarsius Spectrum*), Plate 4, fig. 15, the only species of this family whose existence can be regarded as well established, is an inhabitant of several islands of the Indian archipelago, especially Celebes, Borneo, and Banca; it also occurs in the Philippine Islands and Sumatra. It is an elegant little creature, about the size of a common rat, clothed with a soft reddish-brown fur, and furnished with a long slender tail, the extremity of which is tufted. The most remarkable peculiarity in its structure is the conformation of the hinder extremities, which are of great length, and upon which this little animal is described as leaping about in the forest like a frog. The tarsi are much elongated and very slender, but the feet are considerably widened at their extremity, and the toes exhibit a singular relative proportion. The inner toe, the opposable thumb of the hind feet, is large and powerful, but its next neighbour is the shortest of all; the next toe and the outermost one are about equal in length, and that between them is the longest. By this means the foot acquires a singular bunched and deformed appearance, which, however, is probably in some way connected with the habits of the animal.

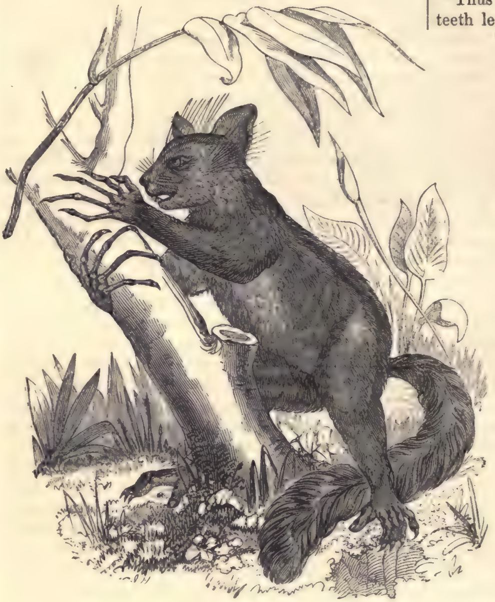
The tarsier is a gentle, inoffensive, nocturnal animal, which may be easily tamed; when it exhibits both intelligence and affection to those who have the care of it. It resides in the damp forests of the islands above mentioned, where it is said by Dr. S. Müller to frequent the tops of the trees, and its food is described by different writers as consisting partly of fruits and partly of insects. The malays call it *Podje*, and, according to Sir Thomas Raffles, the natives of Sumatra have such a superstitious dread of it, that if they chance to see a tarsier upon one of the trees in the vicinity of their rice fields, they will immediately abandon the spot from a fear that some misfortune will otherwise befall them. The true position of this curious creature was long a matter of doubt, some authors having arranged it with the jerboas, and others with the marsupial animals.

FAMILY VIII.—CHEIROMYIDÆ.

We have already stated (pp. 15, 16) that besides the Simiæ and Prosimiæ, or, as they may be called, the Monkeys and Lemurs, two other families are commonly placed in the present order, although the peculiarities of their structure are so remarkable that their true position may still be regarded as a matter of dispute. This is especially true of the present family, which would seem to constitute a connecting link between the widely distant orders of the Quadrumana and Rodentia, partaking so much of the characters of both, as to have been placed alternately, by different zoologists, sometimes in one and sometimes in the other of those orders.

THE AYE-AYE (*Cheiromys madagascariensis*), fig. 7, the only known species of this family is, as implied by its specific name, a native of Madagascar, where it was first discovered by the celebrated French traveller Sonnerat. The name, *Aye-aye*, conferred upon it by him is said to have been borrowed from the expressions of surprise uttered by those natives to whom he showed his specimen, and who had never seen such a creature before; it was, however, supposed by him to be the native name of his new-found treasure, and is now generally received as the name of the animal.

Fig. 7.



The Aye-Aye (Cheiromys Madagascariensis).

In its general appearance the aye-aye is intermediate between the galagos and the squirrels, with the latter of which animals it is placed by those zoologists who refer it to the Rodentia. When adult it measures about eighteen inches in length, and its tail almost as much more. It is clothed with a thick fur composed of two kinds of hair; a thick woolly down close to the skin, and longer smooth hairs, which form the outer coat. The general colour of the fur is a pale rusty brown, with the face and throat lighter; the tail is bushy, and the ears very large and naked. But the most remarkable characters of the animal are, as may be supposed from its doubtful position in the system, to be sought in its structure. The dentition, which, as a general rule, may be regarded as the best character by which to determine the systematic position of a mammal, would seem to indicate the justice of placing the aye-aye amongst the rodents; the incisor teeth, as in those animals, are two in number in each jaw, long, stout, and chisel-like, and the canines are altogether deficient; but the molar teeth, four in the upper and three in the lower jaw, although arranged in the same way as in the Rodentia, present certain characters which are not usual in that order. The skull, in its form, has some analogy with that of the galagos, and the bony orbits are complete—a character which does not occur amongst the rodents.

Thus the characters to be drawn from the head and teeth leave the true position of the aye-aye still very doubtful, and it is only from the structure of the members that we are induced to place this animal with the Quadrumana. The bones of the forearms are distinct throughout their whole length, and both these and the bones of the wrist resemble those of the lemurine animals. The forehands, however, are very peculiar in their structure, the thumb is not opposable, the fingers are exceedingly long and thin, the fourth being the longest, and the third the thinnest; all are terminated by large nail-like claws. In the hinder-hands, on the contrary, there is a distinctly opposable thumb, and the claw of the first finger is evidently more elongated and awl-shaped than those of the others, in the same way as in the true lemurs. Another singular character is the position of the teats, which are situated on the groin.

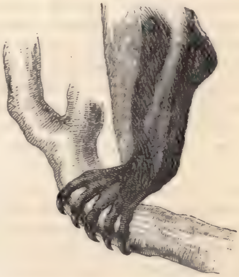
The aye-aye would appear to be rare even in its native forests; only three specimens have been brought to Europe, and these are in the museum of the *Jardin des Plantes* at Paris. This rarity may, however, be due to the habits of the animal, which is a strictly nocturnal creature, sleeping during the day concealed in holes in the ground. It is described as being exceedingly sluggish, but we still know little or nothing of its general habits and food. According to Sonnerat it is insectivorous, and employs its long fingers in drawing larvæ from their holes in the trees; but the specimens which lived for two months in his possession were fed with boiled rice, which they took up with their hands, "using the slender fingers," as Sonnerat expresses it, "in the same way that the Chinese employ their chop-sticks." Other writers have supposed the aye-aye to be a frugivorous animal, and it must be confessed that the form of its molar teeth do not indicate an adaptation to an exclusively insect diet.

FAMILY IX.—GALEOPITHECIDÆ.

Notwithstanding the singular characters presented by the animals forming this family, the last that we shall refer to the order Quadrumana, their position in the system is by no means so puzzling as that of the *Cheiromys;* in fact there can hardly be a doubt that they form a connecting link between the two contiguous orders of the Quadrumana and Cheiroptera, so that the only question is whether we shall place them with one or other of these orders, or, as has been done by Professor Van der Hœven, admit a distinct order for their reception. The latter course does not appear to us to be at all necessary, and we think it will be evident from the following description of the conformation of these singular creatures that their affinities are much closer to the lemurine quadrumana, than to the bats.

THE GALEOPITHECI, or *Flying Lemurs*, differ from the rest of this order in the want of opposable thumbs on all the feet, these being composed of five digits of nearly equal length, arranged in the same plane, and united to each other by a membrane (fig. 8). The limbs are rather long and slender, and on each side of the body, taking its rise from the neck and extending to the wrists, ankles, and even between the hinder limbs to the very extremity of the tail, is a broad hairy membrane, looking, at the first glance, like an ample cloak, in which the creature might wrap itself up warmly in case of need. The office of this membranous expansion is, however, very different; when in use it is widely extended by means of the limbs, and then serves its possessor in the way of a parachute, enabling him to spring from tree to tree at great distances. Hence the name of flying lemurs by which the galeopitheci are commonly known. But it must not be supposed that this action constitutes true flight; it is merely a parachute-like sailing through the air; the impetus being given by the spring of the creature from an elevated position, the expanded membrane buoys it up for a considerable distance, although it has no power to sustain or elevate itself in the air by its own exertions. A similar structure, adapted to the same end, occurs in the flying squirrels, and flying phalangens, and it is widely different from the true wings by which the bats are enabled to take their swift and noiseless flights through the dusky evening air.

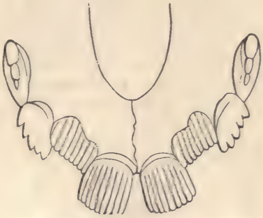
Fig. 8.



Hind foot of Galeopithecus volans.

In the general form of the skull the galeopitheci resemble the lemurs, but the orbits are open behind as in the bats. The structure and arrangement of the teeth are, however, different from anything we meet with in any other group of mammals. The incisor teeth are four in number in each jaw, but those of the upper jaw are placed quite at the sides, in a line with the molars, so as to leave a wide vacant space in front above the lower incisors. The hindmost of the upper incisors are also remarkable for having two roots, a character which does not occur in any other mammal. The lower incisors are inclined forwards as in the lemurs, broad and flat, and with their crowns curiously cleft in such a way that they resemble small combs (fig. 9); the canines are wanting in the upper jaw, small and notched at the edge in the lower one; and the molars are six in number on each side of each jaw, and sharply tubercled.

Fig. 9.



Lower incisor teeth of Galeopithecus volans.

Of the other characters presented by these singular creatures we need only notice that they possess two pairs of teats, all placed upon the breast.

THE FLYING LEMUR (*Galeopithecus volans*), Plate 4, fig. 16, is a native of several of the large islands of the eastern seas, especially Java, Sumatra, and Borneo, and also of Penang, Siam, and the peninsula of Malacca on the continent of Asia. It is of a blackish-grey colour above, with some whitish spots, and of a tawny-grey beneath; its feet are blackish, and its total length about eighteen inches.

In the luxuriant forests of the countries above-mentioned, the flying lemurs exist in considerable abundance, but they are said to select particular spots for their dwelling-places, especially gentle hills covered with young trees, in the thick branches of which they find a secure retreat, and quietly sleep away their days. The night is the season of their activity, and then they may be seen springing obliquely from one tree to another, often at a distance of a hundred yards or more, at the same time uttering a hoarse, croaking, disagreeable noise. On the ground, however, they are very helpless, advancing by a succession of little awkward leaps until they reach some object which they can ascend, when they climb up by the aid of their claws, somewhat in the manner of a cat. They feed upon fruits and young leaves, preferring those of the cocoa, palm, and the *Bombax pentandrum*, to the plantations of which, surrounding the native villages, they often do much injury. According to some authors they do not adhere strictly to a vegetable diet, but feed also upon insects, and even upon small birds when they can seize them.

ORDER III.—CHEIROPTERA.

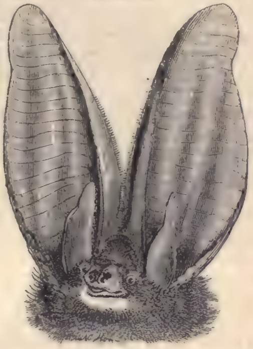
To this small and well-marked class of mammals, it must be confessed, naturalists have not given that attention which the subject demands. Though for the most part composed of individuals of comparatively insignificant bulk, they have nevertheless important claims upon our consideration, both on account of the singular and characteristic modifications of organic structure they exhibit, and in respect of the part they play in the economy of creation.

With regard to the habits of the bats and their manner of living, the first and most conspicuous peculiarity presented to ordinary observation has reference to their mode of flight, and the agency by which this function is performed. As the majority of our readers are aware, their titular name *Cheiroptera*, or Wing-handed family, points at once to the members of the body, primarily concerned in the office of flying; but while the flight of birds is immediately brought about by a development of special integumentary appendages in the form of feathers, we have here the same purpose served by a membranous extension of the skin itself. The membrane is extremely delicate and elastic, extending in front from the neck and sides of the body to the extremity of the fingers of each upper limb, and behind to the tail and to the heels of the feet. It is thus that nature displays her indefinite resources, being in no way hindered by such arbitrary laws as operate in the fabrication of works of art. Look at the character of a bat's flight. Generally speaking its aerial progression is easy, regular, and sustained. It has a velocity sufficient to insure the overtaking and capture of its swiftest insect prey; while its strength is such as to enable the maternal parent to carry one or two young ones on her back at the same time, during her passage through the air. Considering the solidity of their bony framework, and the absence of such air cavities as are found in birds, it would at first sight appear that bats have relatively a greater specific gravity than birds, and consequently a greater degree of aerial pressure to contend with. This apparent disadvantage, however, is more than counterbalanced by a proportionably greater extent of surface presented by the wings as compared with the weight of the body, than obtains in the feathered tribe. We have here in short all the essential conditions for a rapid aerial progression, namely, an appropriate form, a weak specific gravity, and a special modification of the anterior locomotive organs, forming an elastic extensile membrane. These conditions enable the Cheiroptera to realize a capacity of flight second only in degree of perfection to that of birds. In no other family of the first great division of the animal kingdom is this physiological action witnessed, unless indeed we are to exalt the leaping powers of the *Galeopithecus volans* to a species of flight. This animal, more familiarly known as the flying cat, or flying lemur, is also provided with an elastic membrane of a more limited extent than that of bats, but covering and connecting together the anterior and posterior extremities; this structure is not only incapable of raising the creature in the air, but performs rather the office of a parachute than that of an organ of flight.

The remarkable adaptations thus rendered subservient to the purposes of flight, are further, and perhaps more cogently, illustrated by referring to the skeleton (Plate 34, fig. 110). Here we find the solid framework of the body more or less attenuated in all its elements, with the view of imparting lightness on the one hand, and of retaining strength on the other. Every bone indicates the care taken to provide against any unnecessary weight. The skull is elongated from before backwards, and its constituent parts thinned out in a striking manner; this elongation, however, is less conspicuous in those bats which feed on insects, and there are several other cranial peculiarities indicating greater strength in the insectivorous than in the frugivorous species. Among these may be mentioned an increased breadth in the form of the jaws in the carnivorous kind, this group also having the cusps of the teeth sharp and pointed, while those of the fruit-eating section are broader, blunter, and deeply grooved longitudinally. All the bats display four canine teeth, but the number of incisors and molars or grinding teeth varies considerably. Of the latter there are never less than three on either side of each jaw, while very frequently we find five in the upper and six in the lower, an arrangement which is occasionally reversed. With regard to the incisors, or cutting teeth, there are usually two or four in the upper jaw, and two, four, or sometimes six, in the inferior jaw. The backbone, or chain of bones, termed the vertebral column is chiefly remarkable for the large size of its spinal or neural canal, and the comparative breadth and strength of the bones of the neck. The vertebræ, to which the ribs are attached are eleven or twelve in number, according to circumstances; but those succeeding are more variable in this respect, from four to seven being assigned to this so called lumbar region. The bones of the tail, or coccygeal vertebræ, exhibit a still more striking irregularity, and present, as it were, a gradual dwindling away towards the delicate filamentary extremity in those species of Vespertilio where they are most numerous. In the genus Pteropus, indeed, there is no tail whatever, but in the species of Noctula we find six bones, while as many as twelve occur in the genus above mentioned. All the ribs, with the exception of the first pair, have an extraordinary length, relatively more, we may say, than occurs in any other mammalian family. The breastbone, or sternum, is also unusually long and broad, the anterior part, or manubrium, as it is called, having a surprising lateral expansion in certain of the genera, and most conspicuously so in the horse-shoe bats. In all the species this portion of the little flat chain of bones, collectively termed the sternum, is provided with a more or less prominent central ridge on the under surface, evidently corresponding to the exaggerated keel-like process developed in birds to give attachment to the strong pectoral muscles. We also discover an increase of development of the other bones which enter into the constitution of the shoulder. The clavicles are elongated and much arched superiorly, the bladebone or scapula being likewise very surprisingly developed, more especially in the insect-devouring species. All these arrangements beautifully illustrate the adaptability of this mechanism to the peculiar habits of the Cheiroptera, while they at the same time afford to the unprejudiced truth-seeker the most satisfactory evidences of creative design. The teleological argument, indeed, may be still more vigorously enforced by a consideration of the osseous elements which enter into the formation of the arm, forearm, and hand. To a certain extent we have already touched upon this mechanism, when speaking of the characteristic function of flight. It is here, therefore, only necessary further to observe, that the upper extremity of the humerus or first bone of the arm is large and rounded, while the remainder is cylindrical and slender throughout. The two bones of the forearm, namely the radius and ulna, are curiously modified; the former being extremely long, and the latter only faintly represented by a slender styliform process, or in some cases by a mere rudimentary flat bony nodule. By this significant disposition of parts all rotatory motion is effectually prevented, and those movements of pronation and supination, so essential to the welfare of the human and quadrumanous species, are entirely dispensed with. Had not these changes of structure been introduced, the comfort, nay the very existence of these creatures, would have been jeopardized. Such is the foresight of the Divine Architect! And before concluding this part of the subject, we have further to observe that six small bones enter into the framework of the wrist, two behind, and four in front; one of the former row being singularly bulky, probably because two other carpal bones, usually assumed to be absent, do in reality enter into its constitution. Succeeding these are the immensely elongated metacarpals and wire-like fingers, the phalanges of which diverge from one another in the expanded condition of the wing, and spread out to reach the lower margin of the elastic skin membrane formerly described. The second digit is the shortest, and the third the longest, while the thumb is comparatively insignificant, and terminated by a hooked phalanx. Finally, the bones of the pelvis, and those of the lower limb, although they share in the general diminution of the osseous fabric quantitively, do not in other respects relatively exhibit those deviations from the normal type of skeletal structure which obtain in the shoulder and superior extremities.

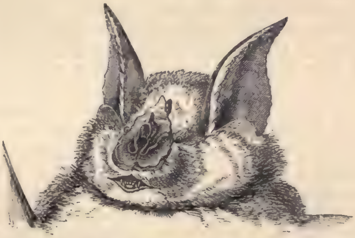
Before proceeding to consider the habits of Cheiroptera, there are several other interesting peculiarities of organization which cannot pass unnoticed. One of the most important of these is the great development of the ears among those bats living upon insects. In some species the external auricles attain a prodigious size (fig. 10), being frequently as large as the head, and occasionally nearly as long as the entire body; and this curious feature is, moreover, combined with an increased development of the internal acoustic apparatus, and a special enlargement of that part of the auditory organ termed the *cochlea*. The eyes of bats are small, and in those kinds which have large ears they are almost concealed from view. The skin, generally, is clothed with a soft downy hair, except on the winged and interfemoral expansions. The sense of smell is remarkably acute, more particularly in the insect-hunting group. Here again we find an increased development of the external organ, precisely analogous to the external ear. Certain individuals are provided with leaf-like appendages attached to the nostrils, and consequently we are fairly entitled to presume that, as in the case of hearing, the auricles are created with the obvious intention of catching sonorous vibrations, so also are the nasal leaflets designed to collect the odorous particles emitted from the bodies of the insects on which these animals prey (fig. 11). The sense of touch is likewise exceedingly sharp. For a long time it was a question with naturalists how the Cheiroptera regulated their flight in caves and recesses of almost absolute darkness, there being no doubt as to the well ascertained fact that their movements, under these circumstances, were conducted with the same skill, ease, and rapidity as in twilight. To solve this problem the eminent physiologist, Spallanzani, instituted a series of cruel experiments. He actually deprived a number of bats of their sight by extracting the eyes, and filling the sockets with pieces of leather. They were then

Fig. 10.



Head of the Long-eared Bat (Plecotus auritus).

Fig. 11



Head of the Greater Horse-shoe Bat (Rhinolophus ferrum-equinum).

permitted to fly about, while various obstacles were placed in their way. Even in this unhappy condition the poor creatures avoided every hinderance, knowingly turned sharp corners, and passed through threads suspended from the ceiling of an apartment, when the intervening spaces between the several cords scarcely exceeded in width the lateral diameter of the animals' bodies from wing to wing. The results of these experiments have been since confirmed. The astonishing phenomena thus exhibited at first induced Spallanzani to believe in the existence of a sixth sense, and this opinion appeared to receive general favour. It was reserved, however, for the illustrious Cuvier to suggest that the faculty in question resided in the winged and interfemoral expansions of the skin, and was immediately due to the high sensibility of that structure. This membrane was then, as now, well-known to be extensively supplied with nerves, but it still remains to be demonstrated whether these nerves terminate in special tactile corpuscles, or touch bodies, such as Wagner not long ago discovered in the tips of the human finger, or whether any other specialization of neural tissue may not be present. In the phyllostomes, or leafy-mouthed bats, the tongue presents a curious sucking apparatus, consisting of numerous processes on the surface; and these acting together enable them to draw in the juices of the animals or fruits on which they feed. In regard to the digestive organs we find modifications of structure coordinating with the varying characters of the teeth in the two principal cheiropterous groups. Those feeding on insects present a simple stomach, such as we see in the ordinary Carnivora, whereas this organ in the frugivorous species displays characters more in harmony with the complicated stomach of vegetable-feeding quadrupeds.

The habits of the bat family are nocturnal or crepuscular. During the day they lie concealed in dark recesses, and are to be sought for in the hollow cavities of trees, in holes of walls, and in rocky caverns; having an especial liking for ancient ruinous buildings, among whose architectural irregularities they discover most appropriate hiding-places, suspending themselves by their hind feet, the head being directed downwards. As the shadows of evening approach with gradually deepening gloom and silence, our twilight-loving friends steal forth from their various snug retreats. The soft moist air of closing day, no longer heated by the summer's sun, is favourable to the chase, while the accumulating sweetness of the balmy air, aggravated, it may be, by the occasional hum or buzz of some insect wanderer as it flits by the lonesome retreat of a half-awakening phyllostome, can no longer be resisted. The contracted crumpled-up wings are now unfolded; the drooping auricles become expanded and erect; the hour for action has arrived, and one by one each issues forth with comforting expectancy. Such being the preparatory attitude and behaviour of our aroused phyllostome, let us now direct our thoughts to the objects of pursuit—what of them? Thus may we soliloquize. Poor insects! you too have issued forth on your self-seeking errands. Hither and thither you glide on in dreamy unconsciousness of the destiny that awaits you. But in carrying out nature's provision for your abundant increase, you have, as it were, exceeded the proper bounds. Though we acknowledge this excess is more apparent than real, you cannot entirely lay claim to our sympathy. We admit it is no fault of yours, yet, there you are, sometimes disputing possession of the air by your intolerable profusion. You have propagated too fast. Like a healthy shrub you have vegetated too actively, and, in a numerical point of view, your very budding outbids all human calculation. To us your success in this particular has become a nuisance, and our welfare is involved in your partial abrogation. I am glad to see the cheiropterous destroyers are at hand, for to them your multiplicity is an occasion of rejoicing. Talk of destruction! In early days the swift-winged arrow did its appointed work, and to-day, alas! the deadly rifle slays its numerous human victims. But watch yon tiny vespertilio, see with what skill she steers her rapid flight. One after another each fluttering victim disappears, as with sudden stroke its course is finished by the flittermouse's grasp. *Sic transit gloria insectorum.* Yet this mode of living is imposed upon the Vespertilio as a wise necessity. She not only purifies the air of superabounding insect forms, but at the same time, secures her proper sustenance; she supports her delicate fabric by the legitimate employment of her means, and accomplishes this purpose without occasioning prolonged pain or unnecessary torture. How suggestive and beautifully true to nature, therefore, are the sacred psalmist's words—"Thou openest thine hand, and fillest all things living with plenteousness."

Another habit among Cheiroptera must not pass unnoticed—we allude to *hybernation.* This remarkable state of inactivity occurs during the winter season, and is a provision of nature not so much brought about by the mere existence of cold, as by the circumstance of the supply of insect food being stopped. It is well known, indeed, that some animals belonging to the insectivorous mammalia, properly so called, hybernate in tropical countries during the summer months, for the excessive heat and dryness of the atmosphere causes the same scarcity of insect life. Whatever may be the explanation of the changes produced in animals so circumstanced, it will be readily understood that those occurring under opposite conditions must be equally astonishing. Here we have a strangely-modified existence—a meagre semblance of vitality—at the portal of whose doors death seems ever ready to enter in and claim possession. Suspended in the secret recesses of his temporary grave, our little bat experiences the chill of those coming events that cast shadows before them. But a short time since we watched his aerial flittings, as he joyously snapped up his prey; but his pastime is over, not a few insects have perished, and the larvæ of others lie buried in the earth, hoping to assume the more perfect imago form in the approaching spring. Left in this apparently forlorn condition, the bat gives itself over to a profound repose, while a series of physiological changes steal over him such as Professor Owen has thus faithfully portrayed—"The breathing becomes gradually slower than in ordinary sleep, the pulsations of the heart diminish in force and frequency, the supply of stimulating arterial blood to the muscles and the brain is progressively reduced, relaxation of the muscular fibres is converted into stiff inaction, and sleep sinks into stupor: at length respiration entirely ceases, and with it those chemical changes in the capillary circulation on which animal heat mainly depends. The preservation of life in its passive or latent state is now due to the irritable property of the heart's fibre, which is excited to contract by the blood in its present dark or carbonized state, and continues to propel it slowly over the torpid frame during the whole period of hybernation. This slow circulation of venous blood through both the pulmonic and systemic vessels is the only recognizable vital act during that period, and the material conveyed by the absorbents into the circulating fluid is sufficient to counterbalance the slight waste thus occasioned. So long, therefore, as the state of torpidity continues, the bat is independent of supplies from without; but it purchases that independence by a temporary abrogation of its vital faculties. Cold, senseless, motionless, and asphyxiated, its entry into death's chamber is prevented only by its being brought to his very door." Such is the sacrifice which this semicadaverous state involves, yet its superinduction furnishes the means of warding off the otherwise inevitable consequence of death by starvation. On the approach of summer the vital forces resume by degrees their wonted functions, and the species again takes part in the pleasures of active life.

With all our boasted national intelligence, it is surprising to how great an extent the minds of the people are still imbued with childish superstitions. The records of our police courts have recently demonstrated the prevalent existence of this barbarous ignorance, in a manner which ought to excite the deepest national self-reproach. Even the harmless, playful, slender little bat, as it innocently chases its lawful prey, is foolishly dreaded as an ominous visitant; and when by any chance an open window gives it entrance to some airy dwelling, what consternation marks the countenances of its human occupants. Ah! exclaims one, there will soon be a death in this house. Yes! replies another, it is a warning to prepare! Stupid peasant, and yet still more senseless lady. Can you not shake off such vain associations? What is there, we ask, in these accidental domiciliary visitations to occasion mystery, horror, or alarm? Let the simple statement of these creatures' habits which we have just given, invite you to admire and caress the beings you have hitherto regarded with gloomiest forebodings.

Bats are found in all quarters of the globe. There is no considerable portion of the earth's surface which cannot produce some members of the family; but, as in quadrumana, certain generic types are common to one country, while, on the other hand distinctive peculiarities characterize those of another. In our own islands, and in Europe, all the species are insectivorous, and most of them belong to the great family of *Vespertilionidæ*, being unprovided with those peculiar nasal leaf-like appendages formerly described. With regard to the distribution of bats in *time*, our readers will anticipate their recent origin in a geological point of view. The few and fragmentary remains with which we are at present acquainted, have, for the most part, been found in the pleistocene, or newest deposits of the tertiary age. Some cheiropterous fossils found in the old caves of Kent's Hole, near Torquay in Devonshire, and in the Mendip hills of Somersetshire, are clearly referable to existing species, while those procured from the lower eocine formation at Kyson, near Woodbridge in Suffolk, and those taken from the Norfolk crag deposits, also belong to existing European genera. The fossil forms found in America appear to be connected with the comparatively recent pliocene formation. Finally, it is worthy of remark, that no remains of extinct Cheiroptera belonging to the frugivorous class are at present known.

FAMILY I.—VESPERTILIONIDÆ.

The group of individuals associated under this head do not exhibit foliaceous nasal appendages. They are all insectivorous in their habits. They display ten incisive or cutting teeth, namely, four in the upper, and six in the lower jaw. There are, as usual, four canines, but a variable number of molars or grinding teeth. The ears are not remarkably conspicuous, that is to say, very seldom longer than the head, and they are disconnected at the lower part. The fingers are unprovided with claws. The tail is generally a little exserted beyond the investing interfemoral membrane.

THE PIPISTRELLE (*Vespertilio pipistrellus*).—On the authority of the Rev. Leonard Jenyns and Professor Thomas Bell, we are entitled to consider this species as the common bat of Britain, *par excellence.* Some time ago, these gentlemen took considerable pains to show, and they moreover conclusively established the fact, that the form of bat invariably described in the older British natural history works as the common bat of our country, although extremely abundant in continental Europe, was in reality referable to a species, indigenous indeed, yet comparatively rare in this country. The bat here spoken of as scarce, is the mouse-coloured vespertilio. The pipistrelle is a diminutive creature, and is only an inch and a half in length when full-grown. Its ears have an oval-triangular form, and are about two-thirds longer than the head, being cleft at the outer margin. In a state of repose it is commonly detected in the crevices and fissures of old brick walls, and especially in all kinds of recesses connected with human habitations. Gnats and other members of the dipterous class seem to constitute its favourite food, but it would be difficult to limit its choice in this particular. Mr. White, in his oft quoted "Natural History of Selborne," gives an interesting account of the feeding of a tame bat, which in all likelihood was an example of the species we are now discussing. He says it was wont to "take flies out of a person's hand; if you gave it anything to eat, it brought its wings round before the mouth, hovering and hiding its head, in the manner of birds of prey when they feed. The adroitness it showed in shearing off the wings of flies, which were always rejected, was worthy of observation, and pleased me much. Insects seemed to be most acceptable, though it did not refuse raw flesh when offered;

so that the notion that bats go down chimneys and gnaw men's bacon, seems no improbable story. While I amused myself with this wonderful quadruped, I saw it several times confute the vulgar opinion, that bats when down on a flat surface cannot get on the wing again, by rising with great ease from the floor. It ran, I observed, with more despatch than I was aware of, but in a most ridiculous and grotesque manner." These latter remarks have received ample confirmation from the observations of several distinguished naturalists. Speaking of the pipistrelle, Mr. Bell states, as the result of his experience, that this bat is capable of running along the ground with greater celerity than any other species with which he is acquainted; whilst its power of climbing showed a "corresponding degree of agility." He adds, "I have often seen the pipistrelle rise from a plain surface with a sort of spring, instantly expand its wings, and take flight. This was repeated by a single individual several times in the course of an hour, and without the slightest appearance of difficulty or effort; it was, on the contrary, evidently a natural and usual action." The error, therefore, of the commonly-entertained notion respecting the bat's inability to rise from the surface of the ground, is clearly manifest, and if further proofs were wanting, we might furnish additional evidence to this effect from equally trustworthy sources.

THE NOCTULE (*Vespertilio noctula*).—This is commonly known as the Great Bat of Britain. It is a large species, measuring very nearly three inches in length; nevertheless, it is not, as erroneously stated in some works, the largest of our indigenous Cheiroptera, seeing it is considerably exceeded in size by the mouse-coloured bat above mentioned. The head is rounded and broad transversely; the muzzle being short, wide, and abruptly truncated. One of the most striking features in this bat, is the length and extent of the wings, measuring in the full-grown individual, while outstretched, at least fifteen inches from tip to tip. As might be expected, this large amount of wing surface gives a corresponding power of rapid flight; for the performance of this function it is, indeed, eminently distinguished, and exhibits a particular liking for the higher regions of the atmosphere, where it rapidly glides along uttering wild discordant cries. The most interesting and detailed observations on record respecting the habits of this creature, are those communicated to the Zoological Society of London by Mr. Daniell. In the published proceedings of that body it is stated, that "on the 16th of May, 1834, Mr. Daniell procured from Hertfordshire five specimens of the *Vespertilio noctula*, four females and one male. The latter was exceedingly restless and savage, biting the females, and breaking his teeth against the wires of the cage, in his attempts to escape from his place of confinement. He rejected food, and died on the 18th. Up to this time the remaining four continued sulky; but towards evening, they ate a few small pieces of raw beef, in preference to flies, beetles, or gentles, all of which were offered to them; only one of them, however, fed kindly. On the 20th one died, and on the 22nd two others, each of which was found to be pregnant with a single fœtus. The survivor was tried with a variety of food, and evincing a decided preference for the hearts, livers, *et cetera*, of fowls, was fed constantly upon them for a month. In the course of this time, large flies were frequently offered to her, but they were always rejected, although one or two May-chafers (*Melolontha vulgaris*) were partially eaten. In taking the food, the wings were not thrown forward, as Mr. Daniell had observed them to be in the pipistrelle; and the food was seized with an action similar to that of a dog. The water that drained from the food was lapped; but the head was not raised in drinking, as in the pipistrelle. The animal took considerable pains in cleaning herself, using the posterior extremities as a comb, parting the hair on either side from head to tail, and forming a straight line along the middle of the back. The membrane of the wings was cleaned by forcing the nose through the folds, and thereby expanding them. Up to the 20th of June, the animal fed freely, and at times voraciously; remaining during the day suspended by the posterior extremities at the top of the cage, and coming down in the evening to its food. The quantity eaten sometimes exceeded half an ounce, although the weight of the animal itself was no more than ten drachms. On the 23rd, Mr. Daniell observing her to be very restless, was induced to watch her proceedings. The uneasiness was continued for upwards of an hour; the animal remaining all this time in her usual attitude, suspended by the posterior extremities. On a sudden she reversed her position, and attached herself by her anterior limbs to a cross wire of the cage, stretching her hind legs to their utmost extent, curving the tail upwards, and expanding the interfemoral membrane so as to form a perfect nest-like cavity for the reception of the young. In a few moments the snout of the young one made its appearance, and in about five minutes the whole of its head was protruded. The female then struggled considerably until the extremities of the radii had passed; after which, the young one, by means of a lateral motion of its fore limbs, relieved itself. It was born on its back, perfectly destitute of hair, and blind. The mother then cleaned it, turning it over in its nest; and afterwards resuming her usual position, placed the young in the membrane of her wing. She next cleaned herself, and wrapped up the young one so closely as to prevent any observation of the process of suckling. The time occupied in the birth was seventeen minutes. At the time of its birth, the young was larger than a new-born mouse; and its hind legs and claws were remarkably strong and serviceable, enabling it not only to cling to its dam, but also to the deal sides of the cage. On the 24th, the animal took her food in the morning, and appeared very careful of her young, shifting it occasionally from side to side to suckle it, and folding it in the membranes of the tail and wings. On these occasions her usual position was reversed. In the evening she was found dead; but the young was still alive and attached to the nipple, from which it was with some difficulty removed. It took milk from a sponge, was kept carefully wrapped up in flannel, and survived eight days; at the end of which period its eyes were not opened, and it had acquired very little hair. From these observations, it is evident that the period of gestation in the noctule exceeds thirty-eight days." According to the observations of Mr. White of Selborne, this species does not make its appearance on the wing until the latter part of April, and not after the month of July. The same authority first noticed that the body of the noctule emitted an offensive odour. Throughout Europe it may be said to be a common species. In Dr. Gray's catalogue of specimens preserved in the British Museum, this bat is called *Noctulinia altivolans*, the latter word indicating its most characteristic habit.

THE SEROTINE (*Vespertilio serotinus*).—This is a moderate-sized bat, having a length of little more than two inches and a half, exclusive, of course, of the tail. The ears are tolerably large, the body being clothed with a long, soft, downy covering of a reddish-brown colour above, and gradually shading off to an obscure yellow tint at the under part of the body. Mr. Bell says, "It appears to have very much the habit of the noctule, at least as far as regards its late appearance in the spring, and its sound and long-continued slumber. It flies from evening till morning, when the state of the atmosphere is favourable. In France, where it is far from being rare, it frequent forests, where it flies among lofty trees. It is also commonly found amongst the huge piles of wood in the timber yards of Paris, seeking its place of repose on the tops of the highest piles. With us it appears to be a rare species, not having hitherto been found anywhere but around London. Its flight is slow; it shuns society more than most other bats, being generally found either solitary or in pairs. It has only one young one at a birth—about the end of May in France, probably somewhat later in this country. It is found in Germany, Holland, France, and Switzerland." In the catalogue of Mammalia preserved in the British Museum, this species is designated *Scotophilus serotinus*.

THE MOUSE-COLOURED BAT (*Vespertilio murinus*).—There can be no doubt that this is the largest of our indigenous Cheiroptera, as it far exceeds the noctule in length, measuring three and a half inches from the muzzle to the base or root of the tail. It is, as we have before stated, a common species in continental Europe, but exceedingly rare in Britain. The head is elongated, and narrower in front than obtains in any of the foregoing species; the eyes are conspicuous, and placed well forward; the ears are broad at their base, but markedly pointed at their tips. Its habits are gregarious, and it has a special fondness for old buildings. It is a very pugnacious animal, and it may be remarked that its general appearance seems to indicate such a ferocity of disposition. Moths appear to constitute its principal insect food. In the British Museum catalogue this is also classed under the genus *Scotophilus*.

NATTERER'S BAT (*Vespertilio Nattereri*).—In accordance with a distinguishing character which more or less marks this species, Mr. Bell designates it the Reddish-grey Bat. The rules observed in naming species are of necessity very arbitrary; and although, to the eye of a well-trained practical naturalist, a variation of colour is readily appreciated, by the general observer of nature differences in this respect are easily overlooked; unless, indeed, they exhibit the most palpable significance. Independent of the opportunity of variety afforded by the introduction of authors' surnames into our natural history nomenclature, it also offers an agreeable medium for diffusing the names of distinguished naturalists among those who cannot be expected to know, in all cases, to whom science is indebted for its advances in ancient or even more modern times. Thus, for the sake of illustration, it is doubtless agreeable to the general reader to be aware that the Dr. Natterer, whose name is employed in connection with this bat, was a celebrated Austrian naturalist, who greatly extended our knowledge of the animals of Germany, and who, during his travels in the comparatively new field opened up to him on the Brazilian continent, accumulated a prodigious amount of materials and facts, which have since enlarged the borders of natural history science in various departments. Having said thus much, partly by way of apology for adopting the above English specific title, we have now to observe that this species is scarcely two inches long. The head is small, as compared with the species just described, while the muzzle is pointed and narrow. The ears are about the length of the head, while the little appendage in front, looking like a second ear in some species, and called the tragus, is particularly thin and styliform. In regard to its habits but little has been noticed; nevertheless, Mr. Bell has recorded some interesting observations respecting three examples, which were obtained from one of those well-known artificial caverns in the chalk-pits at Chiselhurst in Kent. "These specimens continued alive for a short time, feeding on bits of raw meat, and exhibiting great familiarity not only towards their companions, but with myself, eating from my hand, and allowing me to meddle with them without evincing fear or anger. One of them was one morning found dead, and partially eaten by his companions; and the remaining two died shortly afterwards. They were active in their habits, running about the cage, and climbing with great agility. Their attitude when running on a plane surface was more horizontal that that of the long-eared bat, though perhaps less so than the pipistrelle, which runs along almost on its belly." Natterer's bat has hitherto, we believe, only been captured in the eastern counties of England. This species will be found in the British Museum catalogue, under the combined generic and specific name of *Myotis Nattereri*.

THE PARTICOLOURED BAT (*Vespertilio discolor*).—This is a well-marked form, and one of the most attractive of the species hitherto seen in this country. It derives its name from the peculiar mottled colour of the fur, the tips of the hairs on the back being of a light-grey colour, while their roots have a rich chestnut hue. On the under surface of the body the hairs are still variegated, but they exhibit a much lighter shade. The particoloured bat measures rather more than two and a half inches in length. The ears are of moderate size, the eyes being particularly small. Throughout Europe this species appears to be everywhere scarce, and only a single example has been taken in England. The specimen in question is now in the British Museum, and is named in the catalogue *Scotophilus discolor*. It was obtained at Plymouth.

BECHSTEIN'S BAT (*Vespertilio Bechsteinii*).—Only a single example of this elegant species has at present been procured, we believe, in this country. The specimen was captured at the new forest in Hampshire, and is preserved in the British Museum. In the catalogue it is designated *Myotis Bechsteinii*. It appears to have a decided preference for woods and thickets, and takes up its diurnal abode in hollow trees. It is somewhat exclusive in its habits, mixing only with individuals of its own kind, and then only in small companies. Bechstein's Bat rather exceeds two inches in length; the muzzle is a little attenuated and pointed, while the ears are scarcely longer than the head.

DAUBENTON'S BAT (*Vespertilio Daubentonii*).—Throughout Europe this mammal appears to have a pretty wide distribution, and in the United Kingdom it has been taken at the far north of Scotland. It is very little longer than the preceding, but the head is considerably shorter, and less pointed in front. The ears are comparatively short, and slightly notched at the external margin. Its flight is low and rapid, and it frequents the neighbourhood of still waters.

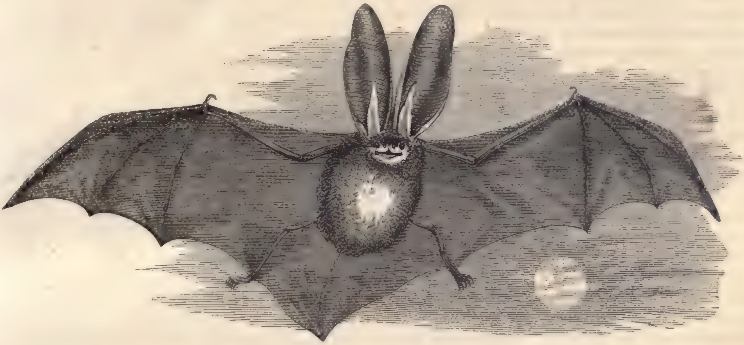
LEISELR'S BAT (*Vespertilio Leisleri*).—Mr. Bell appropriately describes this bat under the cognomen of the Hairy-armed Bat, on account of a remarkable band of hair which passes along the wing membrane at the under surface of the forearm. A solitary specimen has been obtained in this country, and is preserved in our great national museum, and recorded in the catalogue under the generic title of *Scotophilus*. Its habits and places of resort are similar to those of the above species. It is two and a half inches in length; the head is compressed and pointed anteriorly; the ears are short and broadly curved at the upper part.

THE WHISKERED BAT (*Vespertilio mystacinus*).—The masculine title in which this little animal rejoices is imparted to it on account of certain long fine hairs attached to the upper lip; and, whatever may be affirmed by the learned, we think it offers but a feeble apology for the said development. However, the bat is not proud; on the contrary, Mr. Bell avers that it is a "timid and restless species." The living specimen procured by this gentleman, instead of accommodating itself to the lively society of others of the cheiropterous family with which it was associated both in captivity and freedom, obstinately refused food and perished. Its length rather exceeds an inch and a half; the ears are not so long as the head, and they are somewhat notched at the outer margin. This bat has been taken in several of the southern counties of England.

THE BARBASTELLE (*Barbastellus communis*).—This is a very well marked bat, differing from all the preceding in several peculiarities, although it has the ordinary length of two inches. The ears are united below over the forehead, while the nostrils are situated on the upper surface of its short, truncated muzzle. The fur is darker than usual, being nearly black over the region of the spine. The ears are remarkably broad, and of a more or less quadrilateral form; they are irregularly folded at various points, and rather deeply cleft at the outer margin. The eyes are singularly minute, and seem to be almost included within the auricles. According to Mr. Bell, however, this is not actually the case. The eminent naturalist just named, kept a specimen in confinement for several weeks, and the account he has given of its habits are too interesting not to be recorded *in extenso*. "It was taken during a very hard frost in the latter end of December, in a large chalk cavern at Chiselhurst in Kent, which is excavated at the bottom of a shaft seventy feet deep. In this cavern, during very severe frosts, several species of bats are found to retreat; and on this occasion I received with the barbastelle a specimen of *Vespertilio mystacinus*, three of *V. Nattereri*, and several of *Plecotus auritus*. My little prisoners, when brought into a warm room, soon began to exhibit signs of vivacity; and the barbastelle, with the others, fed readily on small bits of meat and drank water. He was a timid animal, and did not evince the slightest disposition to become acquainted with me. He would take his food, however, with his companions, and was accustomed to rest with them in a cluster at the top of the box in which they were placed. The barbastelle certainly became torpid more readily than any of the others, and more completely so; but when awake, evinced extreme restlessness, and was incessantly biting with great violence at the wires of his box. When suffered to fly about the room, he flew very low, and less actively than any other under similar circumstances; and he was fond of lying before the fire on the hearth-rug, where he appeared quite to luxuriate in the warmth. Whilst the long-eared bats showed much attachment to each other, and became very familiar with me, the barbastelle remained sullen and apart, until at length I found that he was an object of persecution on the part of his more active companions, one of whom I detected in the act of giving him a severe bite on the back of the neck. This occasioned his immediate removal to another box; but this sharp discipline probably hastened his death, which took place about a week afterwards, though he continued to eat till the day before he died. The specimen was a male, and apparently an adult." The barbastelle has been frequently captured in England; but it is better known on the continent, especially in France.

THE LONG-EARED BAT (*Plecotus auritus*).—This is one of the most attractive members of the cheiropterous family, and, as its name implies, is possessed of singularly-conspicuous auricular appendages. We have purposely deferred the consideration of it until now, because it exhibits marked affinities with the family which will next occupy our attention. In this bat the ears are more than double the length of the head, and very nearly as long as the entire body, being about an inch and a half from base to apex; the tragi, or lesser ears, as they were termed by old authors, are themselves about half an inch long. It is not, however, in the mere extent of these appendages that their attractiveness is to be considered; it is rather owing to their exquisite transparency, and the power the creature possesses of expanding and contracting them in such a manner as to produce the most elegant festoon-like foldings, or, from the regularity of the flexures thus formed, ever and anon displaying a beautiful feathery appearance (fig. 12). In a state of deep repose the wings lie doubled up and concealed under the arms, while the lesser ears, erroneously so called, still maintain their ordinary posture. When tamed—a condition which it can be readily taught to appreciate—the long-eared bat exhibits a most amiable disposition; and in these days of vivaria it would not surprise us to hear of some person who had started, what might be termed a *cheiropterarium*. It would not, however, be placed under the management of such superstitious individuals as we have formerly described. Yet, seriously, if any doubt the feasibility of such a scheme, or the interest which such a step might create, let them first peruse the experiences Mr. Bell has recorded of our long-eared friends subjected to a state of captivity. He says—"I have frequently watched them when in confinement, and have observed them to be bold and familiar even from the first. They are very cleanly; not only cleaning themselves after feeding and at other times with great assiduity, but occasionally assisting each other in this office. They are very playful too, and their gambols are not the less amusing from their awkwardness. They run over and against each other, pretending to bite, but never harming their companions of the same species; though I have seen them exhibit a sad spirit of persecution to an unfortunate barbastelle which was placed in the same cage with them. They may be readily brought to eat from the hand; and my friend, Mr. James Sowerby, had one during last summer (1836) which, when at liberty in the parlour, would fly to the hand of any of the young people who held up a fly to it, and pitching on the hand, take the fly without hesitation. If the insect were held between the lips, the bat would then settle on its young patron's cheek, and take the fly with great gentleness from the mouth; and so far was this familiarity carried, that when either of my young friends made a humming noise with the mouth in imitation of an insect, the bat would search about the lips for the promised dainty." What think you of this? Let the hypercritical sceptic give his attention! Some people, we know, are shocked at the idea of making friends with what they are pleased to term a horrid bat—a creature, which, in their estimation, is almost a representation of Satan himself—a creature, say they, whose actions will not bear the light of day—an eventide wanderer, whose boon companions are "spirits of evil and goblins damned"—harpies, they say, such as "fell upon the hastily-spread tables of Virgil's hero and his friends, and polluted, whilst they devoured, the feast from which they had driven the affrighted guests"—beast and bird united monsters, whose prerogative it is to reveal whispered utterances of secret thoughts profound! Hence! hence! ye broad-winged devils, hence! Reminiscences of dark and bloody deeds long past already overspread our frame—freezing chills now enervate and paralyze our souls! Begone, begone, revolting creatures! misshapen forms! who can doubt your horrid mission? who abide your thrice-accursed presence?

Fig. 12.



The Long-eared Bat (Plecotus auritus).

Whether real or fancied, such have been the imaginings of the ignorant and superstitious of ancient times, whilst to poet and painter alike our innocent and harmless Vespertilios have furnished ample material for mysterious and overwrought pictures. Virgil, in his third Æneid, represents Æneas and his companions as making a descent upon the coast of one of the Ionian islands. Proceeding inland, they next secured from the plains a quantity of cattle, and forthwith prepare themselves a feast, when, lo! the bats appear, and thus we may freely render into English the imaginary scene which he there depicts—"*Suddenly, from the mountains, the harpies descend with terrific violence, shaking their wings, and uttering piercing cries! Our rich dainties are torn asunder and polluted by their foul grasp! We retreat under the shelter of an overhanging rock, and, relighting our fires, resolve once more to prepare the desired feast! Alas! here come the noisy crowd again, to pollute our precious booty with their hooked talons and horrid mouths! To arms! Let us wage war upon the dreadful race! Are your swords drawn? From yon lofty spot Misenus gives the signal! The trumpet sounds! Away we rush to the attack, 'to violate with the sword these filthy birds of the sea!' All in vain! Unharmed, with swift impetuous flight they disappear* *beneath the stars, leaving our spoil half-eaten and corrupt!"* Such in brief are the sentiments conveyed by the poet Virgil, who usually speaks of our cheiropterous friends as so many "dreadful and filthy birds" (*diræ obscenæque volucres*); in one place, however, a character is introduced in the form of an ill-starred prophetess, who advocates their cause, calling them "innocent harpies (insontes harpyias)."

In conclusion we may remark, that during the state of repose, the long-eared bat is generally found in old buildings and under the roofs of houses, and when on the wing it emits a sharp shrill cry. If placed on the ground, it moves forward by a peculiar jerking action from side to side, at the same time keeping the head well raised. In the published catalogue of Mammalia preserved in the British Museum, this species is denominated *Plecotus communis*.

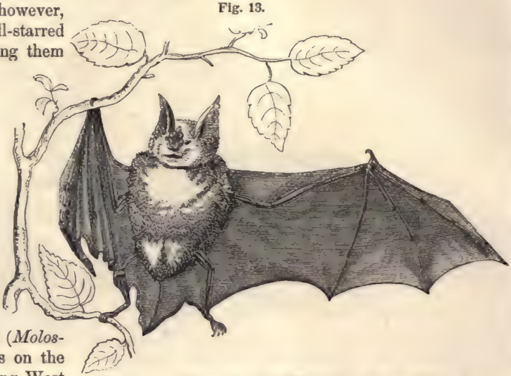
THE SWIFT-FLYING THICK-LIPPED BAT (*Molossus velox*), Plate 5, fig. 19. This species lives on the Brazilian continent, and certain of the adjoining West Indian islands. In common with several others of the cheiropterous group inhabiting the north-east coast of South America, it is usually known as the Bull-dog Bat, but this latter term is now better understood to apply exclusively to that particular species of the so called bull dog-bats, which is indicated in the catalogue of Mammalia preserved in the British Museum under the title of *Noctilio Americanus*—a bat also obtained from the coast of Brazil. The genus Molossus is marked by the presence of large ears and a short head, which is abrupt and swollen at the muzzle. The tail is long, and projects beyond the square-shaped intercrural membrane. The teeth are twenty-eight in number, that is, four incisors, four canines, and five molars on either side of the upper and lower jaws.

FAMILY II.—RHINOLOPHIDÆ.

The group of bats associated under this head, though correctly separated into a distinct family, do not, in their habits at least, depart very materially from the insectivorous Vespertilionidæ already described. Their distinguishing characteristic consists in the possession of a membranous appendage, which in some species is remarkably complicated. In those instances where this membrane is double, the form of the anterior division is more or less heart-shaped, the posterior division having the aspect of an erect lanceolate leaf with the apex directed towards the forehead. The ears are invariably large, separated from one another, and destitute of that usually narrow process called the *tragus*. Occupying the situation of this latter structure, however, we frequently find a lobed and projecing membrane developed from the base of the external margin of the auricle.

THE GREATER HORSE-SHOE BAT (*Rhinolophus Ferrum-equinum*).—The family characters above given sufficiently explain the general form of the integumentary appendage which constitutes so conspicuous a feature in this and other members of the horse-shoe bats, and imparts to them a strikingly hideous aspect (figs. 11 and 13). The greater horse-shoe bat is about two-and-a-half inches long, exclusive of the tail. The head is elongated and swollen towards the muzzle; the anterior leaf-like appendage embraces the nostrils, and has the remarkable horse-shoe shape from whence the English name is derived. Between this and the posterior lanceolated appendage, there is a cup-shaped cavity surmounted by a sort of overlapping crest. With respect to the use of these complicated structures, various suggestions have been offered; but on the whole, as we have already hinted, they are rather to be regarded as extensions of the smelling surface, with the view of accumulating odorous particles, than as subserving any other office. In concealment this bat is only found in the very darkest and most gloomy recesses, where the light of day can gain no access, and where a noiseless solitude reigns supreme. Natural caverns among rocks, or subterranean chambers artificially hewn out in quarries now long ago forsaken, are its loved retreats. From these situations it issues forth to seek its twilight repast on maychafers and their insect associates.

Fig. 13.



The Greater Horse-shoe Bat (Rhinolophus ferrum-equinum).

THE LESSER HORSE-SHOE BAT (*Rhinolophus hipposideros*).—Both this and the foregoing are European species and found in England, though neither of them can be said to be very common. At one time the present species was supposed to be only a variety of the greater horse-shoe bat; but naturalists no longer entertain any doubts as to their respective distinctness from one another. One of the principal marks by which this form is distinguished, consists in the presence of an additional filiform nasal appendage placed immediately in front of the ordinary lancet-shaped process which occupies the frontal region. On account of this structure, the eminent zoologist Geoffroy named the species *Rhinolophus bihastatus*, while to the greater horse-shoe bat he applied the specific title of *Rhinolophus unihastatus*. In other structural particulars, and in their habits, the two kinds bear a very close resemblance.

THE NOBLE HORSE-SHOE BAT (*Rhinolophus nobilis*).—This is one of the largest and rarest individuals of the horse-shoe family, measuring four inches in length, and having from tip to tip of the wings a lateral expansion of nearly twenty inches. It was first described by Dr. Horefield, who informs us that in the native language of the Javanese it is termed *Kèbbelĕk*. The body is clothed with a soft downy covering, the hairs of the fur being extremely fine and long. According to Mr. Ogilby's description, the "nasal apparatus consists of a broad membrane, stretching transversely across the nose in the form of a shelf. The sides are bounded by several parallel folds, and inferiorly it constitutes a semicircular envelope, which has a short obtusely rounded point in the middle." The colour is brownish above and greyish beneath. In the British Museum catalogue it is designated *Hipposideros nobilis*.

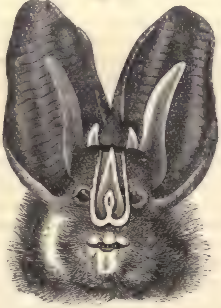
FAMILY III.—PHYLLOSTOMIDÆ.

The Phyllostomes are, in common with the preceding family, possessed of complex nasal appendages. The typical species have four incisors in each jaw, of which the lower are very small, and are placed quite in front of the four canines. The latter are remarkably large, the number of the molars being variable, though there are generally five on either side of each jaw. The tongue is flat, elongated, and extensile, and clothed with papillæ in such a manner as to produce a kind of sucking organ, the lips being also provided with rows of regularly-disposed tubercles. The ears are of moderate size, and furnished with a tragus. The fore-finger is composed of two phalanges, and the middle finger of four. They have very considerable power of running along the ground. The tail is generally short. In some instances it is altogether absent.

THE VAMPIRE BAT, (*Phyllostoma spectrum*), Plate 5, fig. 18.—Few members of the great mammalian series have excited more interest than this celebrated bat. From the earliest times its blood-sucking qualities have been memorialized; and there can be little doubt, as will be presently shown, that its propensities in this respect are truly formidable. In seeking food they appear willing to attack any description of animal coming within their reach; exhibiting, however, a special fondness for the blood of cattle, upon which they fasten themselves while their victims are asleep. Compared with many others of the bat family, it is a huge creature, about the size of a magpie, and measuring upwards of two feet from the tip of one wing to the other. With regard to the various accounts given by travellers as to their ferocious and sanguivorous habits, we prefer to select the authentic statements of Mr. Stedman, who was himself bitten by a vampire, not only on account of their circumstantiality, but also because of the apparently trustworthy source from which they proceed. Captain Stedman thus speaks of these vampires:—"Knowing by instinct that the person they intend to attack is in a sound slumber, they generally alight near the feet, where, while the creature continues fanning with its enormous wings, which keeps one cool, he bites a piece out of the tip of the great toe, so very small, indeed, that the head of a pin could scarce be received into the wound, which is consequently not painful; yet through this orifice he continues to suck the blood until he is obliged to disgorge. He then begins again, and thus continues sucking and disgorging till he is scarcely able to fly; and the sufferer has often been known to sleep from time into eternity. Cattle they generally bite in the ear, but always in places where the blood flows spontaneously. Having applied tobacco-ashes as the best remedy, and washed the gore from myself and my hammock, I observed several small heaps of congealed blood all round the place where I had lain upon the ground, on examining which, the surgeon judged that I had lost twelve or fourteen ounces during the night." Whatever may be thought of this narrative, it seems generally agreed, that while certain of the Phyllostomata live principally on the juices of fruits, there are others that have a special appetite for the blood of the higher animals, and even of man himself. From this circumstance it would mainly appear, that the supposed existence of certain imaginary spectral monsters, termed vampires, which, in all ages, have been believed in and dreaded by the superstitious, has its origin in the actual mode of life displayed by these creatures. A distinguished writer has observed that, "upwards of a century ago, there prevailed in several districts of Hungary an epidemic dread of vampires, which lasted some years, and gave birth to many extraordinary stories. It was believed that in several places, those among the dead who belonged to the class of vampires, arose nightly from their graves and sucked the blood of the living, who fell into consumptions and perished; that those who had died in this manner became infected with vampirism; and that the only way of exterminating the plague was by disinterring all the suspected vampires, and, if it were discovered that they exhibited the tokens of their hideous character, burning them to ashes, or driving a stake through their middle. The attestations which these grotesquely fearful tales received, are among the most singular instances of human credulity recorded in all the annals of superstition. They are, in many instances, related on the authority of the pastors, and other most credible persons of villages and towns, who depose to having been themselves witnesses of the scenes beheld on opening the vampires' graves. Some, indeed, had actually seen the spectres themselves on their nightly excursions; but more generally the subscriptions are by persons present at the inspection of the dead bodies; when, if the subject was a true vampire, he was generally found of a florid and hale complexion; his hair, head, and nails had grown; his mouth, hands, *et cetera*, were stained with fresh blood; his eyes open and brilliant. Sometimes when the stake was driven through him, he was heard to utter cries like those of a living person. It was believed that the consumption produced by the sucking of the vampire could be cured by eating earth from his grave." Such is a specimen of the follies displayed by the profoundly ignorant and superstitious. Surpassing strange it is, that intellectual human beings can be sufficiently debased to allow a suggestive idea to gain such entire possession of the frame. That many of the parties believed what they stated to be strictly true, we have no manner of doubt; for the phenomena of mental aberration thus produced, are strictly analogous to those cerebral manifestations which a weak mind exhibits when allowed to be under the controlling power of another. This is the true solution of mesmerism, as the writer of this article can confidently state, from having experienced on his own person all the ordinary mental changes, absurdly termed electro-biological, sometimes voluntarily forced upon the mind by his own ideal associations, at other times superinduced by submission to a so-called mesmerist. It were well if these practices and their kindred superstitions could be eternally abandoned by the ascendancy of a strong-minded intelligence, coupled with a due supply of common sense; and thus shall humanity rejoice in the possession of the *mens sana in corpore sano*. In some parts of Europe, even at the present day, vampires are believed in, and this is particularly the case in the island of Crete, where the spectres are termed Katakhanàs. The Phyllostome, captured by Mr. Darwin while it was engaged in removing blood from the neck of a horse, is, we believe, referable to this genus.

THE AFRICAN LEAF BAT (*Megaderma frons*).—The members of this genus were formerly classed with the Vespertilionidæ proper, but their affinities connect them more closely with the present family. In many respects they differ from the typical Phyllostomata. They have no cutting teeth in the upper jaw, though in the lower they have the typical number. They have, it is true, the usual four canines; but of the molars there are only four on either side of the upper, and five on either side of the lower jaw. The membranous apparatus of the nose is complicated, there being three distinct leaflets, "one vertical, one horizontal, and one inferior of the horse-shoe form." The ears are particularly striking, being ample, oval, furnished with a tragus, and so united over the region of the forehead as to impart a heart-shaped outline to the entire physiognomy, more conspicuously, perhaps, than obtains in any other species (fig. 14). The Megaderms are also blood-suckers, and it is probable that their power of suction is facilitated by the absence of incisive teeth in the upper jaw; indeed, the very bones themselves—*i.e.*, the intermaxillaries—in which the incisives are normally implanted, are only represented in this genus by a minute cartilaginous plate. The Megaderms are confined to the Eastern hemisphere. This species is obtained from Senegal and Gambia on the coast of New Guinea, West Africa. In the catalogue of bats contained in the British Museum it is marked *Lavia frons*.

Fig. 14.



Head of the African Leaf Bat (Megaderma frons).

FAMILY IV.—PTEROPIDÆ.

The bats classed together under this common title are significantly distinct both in habits and structure. They are almost exclusively frugivorous. Their heads are elongated and hairy. The grinding teeth have flattish tuberculated crowns, with a central longitudinal groove. The ears are not furnished with a tragus. The fore-finger consists of three phalanges, and is seldom armed with a claw. The tail is frequently wanting, or, when present, very short; the abrogated interfemoral membrane being represented by narrow folds connected with the inner margin of the legs. These bats have a wide geographical distribution over the Eastern hemisphere.

THE KALONG (*Pteropus edulis*), Plate 5, fig. 17.—This is one of the best known, and at the same time the largest of the frugivorous bats. The body is about two feet long, while the expanse of the wings from tip to tip is sometimes fully five feet. It is gregarious in its habits, and extremely numerous in the islands of Sumatra and Java; and to those whose livelihood depends upon the culture of fruit gardens, it proves an incorrigible enemy. The graphic account given by Dr. Horsfield merits special quotation, containing as it does almost all that we know of their destructive propensities, and the plans adopted to secure immunity from their attacks:—"Numerous individuals select a large tree for their resort, and, suspending themselves with the claws of their posterior extremities to the naked branches, often in companies of several hundreds, afford to a stranger a very singular spectacle. A species of fig, in habit resembling the *Ficus religiosa* of India, which is often found near the villages, affords them a very favourite retreat, and the extended branches of one of these are sometimes covered by them. They pass the greater portion of the day in sleep, hanging motionless; ranged in succession, with the head downwards, the membrane contracted about the body, and often in close contact, they have little resemblance to living beings; and, by a person not accustomed to their economy, are readily mistaken for a part of the tree, or for a fruit of uncommon size suspended from its branches. In general, these societies preserve a perfect silence during the day; but if they are disturbed, or if a contention arises among them, they emit sharp piercing shrieks; and their awkward attempts to extricate themselves when oppressed by the light of the sun, exhibit a ludicrous spectacle. In consequence of the sharpness of their claws, their attachment is so strong that they cannot readily leave their hold without the assistance of the expanded membrane; and if suddenly killed in the natural attitude during the day, they continue suspended after death. It is necessary, therefore, to oblige them to take wing by alarming them, if it be desired to obtain them during the day. Soon after sunset they gradually quit their hold, and pursue their nocturnal flight in quest of food. They direct their course by an unerring instinct to the forests, villages, and plantations, occasioning incalculable mischief, attacking and devouring indiscriminately every kind of fruit, from the abundant and useful cocoa-nut which surrounds the dwelling of the meanest peasantry, to the rare and most delicate productions which are cultivated with care by princes and chiefs of distinction. By the latter, as well as by the European colonists, various methods are employed to protect the orchards and gardens. Delicate fruits, such as mangoes, jambus, lansas, *et cetera*, as they approach to maturity, are ingeniously secured by means of a loose net or basket, skilfully constructed of split bamboo. Without this precaution little valuable fruit would escape the ravages of the kalong. There are few situations in the lower parts of Java in which this night wanderer is not constantly observed; as soon as the light of the sun has retired, one animal is seen to follow the other at a small but irregular distance, and this succession continues uninterruptedly till darkness obstructs the view. The flight of the kalong is slow and steady, pursued in a straight line, and capable of long continuance. The chase of the kalong forms occasionally an amusement of the colonists and inhabitants during the moonlight nights, which in the latitude of Java are uncommonly serene. He is watched in his descent to the fruit trees, and a discharge of small shot readily brings him to the ground. By this means I frequently obtained four or five individuals in the course of an hour." Several other species of this remarkable genus are known, and in the year 1855 we had an opportunity of watching the behaviour of a specimen of *Pteropus edulis* in the collection of the Zoological Society, Regent's Park. Notwithstanding, however, the great care taken to keep it alive by the necessary degree of artificial heat, our treacherous climate proved too much for it. Still more recently the society procured a living example of an allied species, namely, the Shoulder-knot Bat (*Epomorphorus Whitii*) from West Africa; but this has likewise perished. These bats fed principally upon raisins.

ORDER IV.—INSECTIVORA.

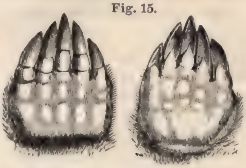
SETTING aside for a moment the remarkable deviations of structure witnessed in the formation of the wings and nasal appendages in the preceding order, we appear to pass by a very natural transition to the insectivorous mammalia, properly so called, at least, when departing from the insect-feeding series of the bat family. Baron Cuvier, be it observed, placed the Cheiroptera at the head of his third great order of unguiculated quadrupeds, collectively termed *Carnassiers;* regarding the few frugivorous bats then known as aberrant departures from the real carnivorous type. As, however, the principal point of similarity connected with these groups consists in the cutting character of the grinding teeth, it will be understood that many other structural considerations, of equal importance in the eyes of naturalists, have determined the propriety of treating certain insectivorous mammals under a separate order. Professor Owen, as we have seen, even places both the Cheiroptera and Insectivora in his lissencephalous subclass—an arrangement which, based on cerebral characters, separates these orders still further from the true carnivora, and brings them nearer the rodentia. The insect-eating bats also resemble the order at present under consideration, by their conical elevations on the molar teeth, while many of the insectivora likewise hybernate, passing the winter in a torpid state. A common character, prevailing more or less throughout the entire order, is noticed in the remarkable uniformity pervading the whole dental series, rendering it at first sight somewhat puzzling to recognize and separate the teeth into their ordinary triad divisions—incisives, canines, and molars. In the more typical forms the canines assume their ordinary conspicuity, being also widely separated from each other, while the incisives are correspondingly small In some members the dental characters approximate towards the Rodentia by the elongated form of the anterior incisors, the remaining cutting teeth, together with the canines, being even shorter than the molars. Certain of the Quadrumana also have a dentition very like this. The head is lengthened, and its constituent bones more slender than in true Carnivora. Another cogent difference from the last-named family lies in the presence of well-developed collar bones or clavicles, which are only occasionally seen in the carnivorous mammalia in a very rudimentary condition. The limbs of Insectivora are generally short, and, with one or two notable exceptions, rather feeble; the feet are furnished with five toes, and in walking the whole sole or palm is applied to the ground, forming a characteristic mode of progression termed *plantigrade*, and shared by a large section of the Carnivora proper; the under surfaces of the feet are also consequently destitute of hair. The lateral integumentary expansions seen in Cheiroptera have entirely disappeared, while the nature of the epidermal covering varies considerably in different genera; the tail is sometimes very short. In this order there is no cæcal appendage to the large intestine. The two mammæ are situated on the abdominal surface. The various species feed principally upon insects, and like the bats are frequently nocturnal and subterranean; a few of them have arboreal habits.

FAMILY I.—TALPIDÆ.

The group of species associated under this title are familiarly termed Moles; and although, on a superficial examination, there does not appear much to invite us to the contemplation of their structural and functional peculiarities, yet, we venture to assert, if any one will undertake to make a close acquaintance with their anatomy, that of all known animal beings, man alone excepted, none will prove more interesting in a structural point of view; and further, none will furnish more striking and incontrovertible evidences of the truthful doctrine of final causes, and the consummate wisdom of creative skill. It is well known these creatures enjoy a subterraneous mode of existence, and it cannot but delight the high-souled teleologist when he perceives that their entire organization is beautifully adapted to, and eminently qualifies them for, such a habit of life. These adaptations are well seen in the skeleton, and selecting that of the common mole (Plate 33, fig. 104), the first peculiarity which meets the eye is the apparent length of the osseous framework—a result which arises rather from the shortness of the limbs and elongation of the head than from attenuation of the body itself. The bones of the neck, A, have very strong transverse processes, for the attachment of muscles; but the second cervical vertebra only is provided with a superior spinous process, to the extremity of which there is articulated a long slender osseous style, which is called the nuchal bone. Altogether there are forty-three vertebræ, that is, seven cervical, fifteen dorsal, B, six lumbar, C, three sacral, D, and twelve caudal, E. The several bones of the head are very early consolidated together, while the nasal cartilage extends forward in front to support the long projecting muzzle. The ribs have a tolerably uniform length, a circumstance which helps to impart a cylindrical aspect to the skeleton. The long narrow bones of the pelvis exhibit a similar appearance of being drawn out, as it were, from end to end. In regard to the hinder extremities, perhaps the only points worthy of remark refer to their general shortening, and the union of the tibia and fibula at the lower third of the leg; in the bones of the foot there is a supplementary tarsal segment of considerable size, assuming in the prepared skeleton the character of a sixth toe. It is, however, in the constitution of the anterior extremity that the most extraordinary skeletal deviations are witnessed, these being well calculated to excite astonishment. The sternum, though not usually described in connection with the bones of the fore limb, is here so intimately associated with the prodigious muscular developments attached to it and rendered necessary to move the arms, that hitherto we have purposely passed it over. It is a very large bone, and the anterior portion or manubrium, as it is called, is excessively prominent, serving to support the collar bones and the first pair of ribs. The clavicles are remarkably short, thick, and of a quadrate form; they form a strong *point d'appui* for muscular action. The scapula or shoulder-blade, on the other hand, is extremely long, and correspondingly narrowed—more resembling, in fact, one of the ordinary cylindrical bones of the limb than its normal characteristic flatness. The humerus or arm-bone proper is, however, the most strangely altered of all, having not only lost the usual elongated character so constant in quadrupeds generally, but presenting an oddly-contorted and jagged outline, utterly incomparable to that seen in any other family. Yet, in all its typical constituent parts, it is a veritable humerus, and by its very abnormality demonstrates how strictly nature adheres to a given archetypal plan, even when the exigencies of the individual seem to require the introduction of a supernumerary element of strength. Observe the remarkable conformity to type. This bone presents an irregularly square-shaped form, and is somewhat compressed laterally. Unlike any other humeri with which we are acquainted, it has two widely separated and distinct articular facets at the superior end; one being articulated to the clavicle, the other to the bladebone. A still more manifest reversion of the ordinary state of things is seen in the situation of the elbow-joint, which, instead of occupying its relatively inferior position, is actually placed on a higher level than the shoulder-joint; and as the limb is turned and fixed in a semi-prone attitude, the palm of the hand is consequently directed outwards and backwards. The bones of the forearm, or radius and ulna, also take part in these abnormal dispositions; the head or upper end of the former assuming a hooked character, while that of the latter is also greatly enlarged. By these arrangements strength is imparted, and all rotation of the limb prevented. There are no less than eleven bones belonging to the carpus or wrist; they are placed in two rows, five in each, while the eleventh is attached to the lower extremity of the radius; this latter is sabre-shaped, and converges outwards towards the lower end of the metacarpal bone of the thumb, giving increased breadth to the spade-like hand. The digital phalanges of the first two rows are particularly short and broad, the terminal series being elongated, pointed, and curved inwards towards the palm. In addition to these skeletal characters, there are others of equal importance, when considered in the light of a family definition. In the typical forms the teeth are forty-four in number, of which there are fourteen incisives, six above and eight below, no true canines, and thirty molars, seven on either side of the lower jaw and eight similarly disposed in the upper; the anterior pair functionally representing the absent canines. The genera Chrysochloris and Condylura exhibit a slight departure from this dental formula. The moles have no external auricles; the eyes are very small, the feet being pendactylous and armed with strong claws; the tail is usually short. Speaking generally, they have a stout thickset appearance; but this is chiefly due to their large fleshy muscles and fatty accumulations, which are also covered by a dense, smooth, furry coat of close-set hair.

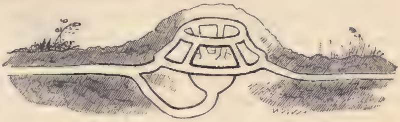
THE COMMON MOLE (*Talpa Europœa*)—Plate 6, fig. 22.—Every rustic is familiar with the habits and oblong form of this little mammal, which measures five inches in length, not including the tail. Destined to pursue its prey beneath the surface of the earth, it is surprising, considering the dense nature of the medium, that it should be able to swim, as it were, through the very soil with a rapidity perfectly astounding. We have already partially unravelled the nature of the mechanism by which these movements are accomplished in our description of the skeleton; but there still remains to be noticed in particular, the scoop-like configuration of the hands, which are convex on the back, and shallowed out at the palm (fig. 15). Every finger is armed with a strong pointed nail, grooved on the under surface, while all of them converge together at the tips, forming a powerful kind of digger or hoe. Of our more common animals, few have had their behaviour and manner of living more thoroughly exposed than the mole. Pennant, speaking of its powers of progression, says—"The breadth, strength, and shortness of the fore feet, which are inclined sideways, answer the use as well as the form of hands, to scoop out the earth to form its habitation, or to pursue its prey. Had they been longer, the falling in of the earth would have prevented the quick repetition of its strokes in working, or have impeded its course; the oblique position of the fore feet has also this advantage, that it flings all the lose soil behind the animal. The form of the bŏdy is not less admirably contrived for its way of life; the fore part is thick and very muscular, giving great strength to the action of the fore part, enabling it to dig its way with great force and rapidity, either to pursue its prey or elude the search of the most active enemy. The form of its hind parts, which are small and taper, enables it to pass with facility through the earth that the fore feet had flung behind; for, had each part of the body been of equal thickness, its flight would have been impeded, and its security precarious. The skin is excessively compact, and so tough as not to be cut but by a very sharp knife; the hair is very short and close set, and softer than the finest silk; the usual colour is black, not but there are instances of these animals being spotted, and a cream-coloured breed is sometimes found in dry lands near Downing. The smallness of the eyes (which gave occasion to the ancients to deny the sense of sight) is to this animal a peculiar happiness; a small degree of vision is sufficient for an animal ever destined to live under ground. Had these organs been larger, they would have been perpetually liable to injuries by the earth falling into them; but nature, to prevent that inconvenience, hath not only made them very small, but also covered them very closely with fur. To make amends for the dimness of its sight, the mole is amply recompensed by the great perfection of two other senses, those of hearing and smelling; the first gives it notice of the most distant approach of danger; the other, which is equally exquisite, directs it in the midst of darkness to its food; the nose also, being very long and slender, is well formed for thrusting into small holes in search of the worms and insects that inhabit them. These gifts may with reason be said to compensate the defect of sight, as they supply in this animal all its wants, and all the purposes of that sense." But the most interesting researches concerning this extraordinary creature, are undoubtedly those of the French writer—Henri le Court. This indefatigable observer pointed out that the mole pushes its way through the soil, not at mere random, in any chance direction; but having selected certain localities or hunting grounds, as they have been called, constructs a habitation or fortress. This is sometimes formed "under a considerable hillock raised in some secure place, often at the root of a tree, under a bank, or any shelter that offers protection. The fortress is domed by a cement, so to speak, of earth, which has been beaten and compressed by the architect into a compact and solid state. Within, a circular gallery is formed at the base, and communicates with an upper smaller gallery by five passages, which are nearly at equal distances (fig. 16). Within the lower and under the upper of these galleries is the chamber or dormitory, which has access to the upper gallery by three similar passages. From this habitation, we should here observe, the high road, by which the proprietor reaches the opposite end of the encampment, is prolonged, while the various galleries or excavations open into this road, which the mole is continually carrying out and extending in its search for food, and which has been termed its hunting ground. But to return to the chamber: from it another road extends, the direction of which is downwards at first, and that for several inches, when it again rises to open into the high road of the territory. Some eight or nine other passages open out from the external circular gallery, but the orifices of these never come opposite to the passages which connect the external gallery with the internal and upper gallery. The extent of these passages is greater or less according to circumstances, and they each return by an irregular and semicircular route, opening at various distances from the habitation into the high road, which differs considerably from all the other passages and excavations, both in construction and with regard to the use to which it is applied. From the habitation this road is carried out nearly in a straight line, and forms the main passage of communication between the habitation, the different portions of the encampment, and the alleys leading to the hunting ground, which open into it on each side. In diameter it exceeds the body of the mole, but its sides will not admit of two moles passing each other. The walls, from the reiterated pressure of the mole's sides against them, become smooth and compact, and its course is remarkable for the comparative absence of molehills, which are frequent in connection with the alleys and

Fig. 15.



Front and back view of the hand or fore-foot of the Mole (Talpa Europæa).

Fig. 16

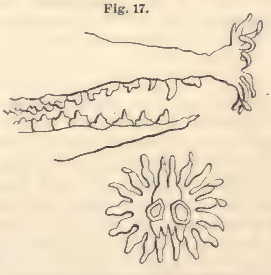


Fortress or habitation of the common Mole.

quarries, as they have been termed, in constructing which the earth is removed out of the way to the surface. Sometimes a mole will lay out a second or even a third road, in order to the extension of its operations. Sometimes several individuals use one road in common, though they never trespass on each other's hunting grounds. In the event of common usage, if two moles should happen to meet, one must retreat into the nearest alley, unless both should be pugnacious; in which case the weakest is often slain. In forming this tunnel, the mole's instinct supplies the place of science, for he drives it at a greater or less depth, according to the quality of the soil or concurrent circumstances. When there is nothing superincumbent threatening a disturbance of its security, it is often excavated at a depth of some four or five inches; but if it is carried under a road or a stream, a foot and a half of earth, sometimes more, is left above it. Thus does the little animal carry on the subterraneous works necessary for his support, travelling, and comfort; and his tunnels never fall in. The alleys opening out from the sides of the high road have generally a somewhat downward inclination, from their commencement towards their end. It has been observed, that when on opening one of these alleys, a plentiful supply of food is found, the mole proceeds to work out branch-alleys from its termination, upheaving new molehills as it advances in quest of prey. Should, however, the soil be barren of the means of existence, the animal commences another alley at a different part of the high road. The quality and humidity of the soil, which regulate the abundance of earthworms, determine the greater or less depth of the alleys. The mainroad being the highway of communication to its different hunting grounds, it is necessarily passed through regularly in the course of the day, and it is in this road that the molecatcher sets his traps, or practises his devices to intercept the animal between its habitation and the alley where it is carrying on its labours. Some molecatchers will tell you that the hours when the moles move are influenced by the tides; to which statement the reader is at liberty to give as much credence as he chooses. Besides the various traps which are set for them, there is, or very lately was, a man who travelled the country with a dog, and destroyed them without any trap at all, by the following process:—Taking his station at the proper time and place, attended by his dog, and armed with a spear or spud, he waits till the dog indicates the presence of the mole, and then spears or spuds the animal out as it moves in its run. Pointers will stop at moles as steadily as at game, when the former are straying on the surface." So much for the observations of Le Court, quoted by Ogilby, whose description appears to have been borrowed from Geoffroy St. Hilaire's abridged account of the original discoveries, as recorded in his "Cours d' Histoire Naturelle des Mammifères." The mole is an extremely voracious animal, and it would further appear from Le Court's investigations, that its appetite is exalted into a regular passion, which occasionally rises to such a pitch that the desire is accompanied with violent excitement. A species of madness seems to take possession of the entire frame, as it furiously rushes upon its prey. Its food is exclusively animal. It is true, and worthy of remark, that this point has been a subject of dispute, but the united testimony of several distinguished naturalists, has conclusively shown that the vegetable debris sometimes found in its stomach, must be regarded as mere accidental accumulations, consisting of fragments of roots and other vegetable matters, which have been swallowed along with its appropriate insect food. After advancing some very acute reasonings on this subject, Mr. Bell remarks, that "the principal object of its search is the earthworm. In pursuit of this, its favourite food, it occasionally follows it towards the surface with such eagerness, that it actually throws itself out of its burrow upon the ground. It has been stated that the mole will not eat the larvæ of the Scarabæidæ and other coleopterous insects that live under the ground; but this is certainly a mistake, as these larvæ have been found in their stomach. It is not, however, to these and similar kinds of food that the mole is necessarily restricted; a mouse or a bird, a lizard or a frog, if placed within its reach, becomes a speedy victim to its voracity. Toads, however, it rejects even when famishing with hunger, probably on account of the acrid secretion of the skin, first noticed by Dr. Davy. Geoffroy gives a curious picture of the manner in which it will approach, seize, and devour a small bird—exhibiting, in the first place, a considerable exercise of stratagem to get within reach of its victim, and changing on an instant this mode of approach for the most sudden and impetuous attack; seizing the hapless bird by the belly, tearing it open, thrusting its muzzle amongst the entrails, where it appears to luxuriate on its bloody repast. Even the weaker of its own species, under particular circumstances, are not exempted from this promiscuous ferocity; for if two moles be placed together in a box without a very plentiful supply of food, the weaker certainly falls a prey to the stronger. No thorough-bred bulldog keeps a firmer hold of the object of its attack than the mole. Mr. Jackson, a very intelligent molecatcher, says that, when a boy, "his hand was so severely and firmly laid hold of by one, that he was obliged to use his teeth in order to loosen its hold. It is not only in the warm and temperate seasons of the year, when the food of the mole is of comparatively easy access and exists in great plenty, that its labours are steadily and regularly followed; in the winter, when the frost has penetrated deeply into the soil, and the ordinary hunting grounds are rendered useless and impracticable, it descends to a considerable depth by a perpendicular shaft, till it arrives at the part to which the earthworms have been driven by the cold. Here its labours must be even more toilsome and less productive than ordinary; but the voracity of this indefatigable gourmand must still be appeased: and as it lays up no store for the winter, and cannot fast with impunity for more than a few hours, it may well be imagined how incessantly and laboriously it must work in such a season, and at so great a depth, to obtain a sufficient supply of worms to satisfy its insatiable craving. This rage of hunger alternates with the most profound repose, which the animal enjoys either within its fortress, during the season in which that domicile is occupied, or in a simple molehill devoted to this purpose, during the summer. Its bed is formed of various vegetable matters, such as grass, leaves, or similar soft substances. It sleeps for about four or six hours at a time in warm weather, and principally during the day—its usual working time being very early in the morning and at night. In the spring the mole leaves the fortress, and does not return to this shelter until the autumn, when it does not generally reoccupy the same edifice, but constructs another, leaving the old one to the occupation of the fieldmouse, or other small animal of similar habits. During the month of June, or longer, it is in the habit of leaving its runs, and wandering during great part of the night on the surface of the land in search of its food." There is also another mode which the mole adopts in capturing his prey, when the soil is light, and when showers of rain have enticed the worms to the surface. This is accomplished by boring shallow trenches immediately under the surface, surprising and catching these unfortunate annelids at the most unsuspected moments. Every one must have observed these mole-runs in fields which have been only recently sown with grain. The mole is a hard drinker, and his appetite in this respect is in perfect harmony with his flesh-eating propensities. He is also a firstrate swimmer, and, as we have seen, his form is singularly adapted for easy propulsion through any firmly-resisting medium. He will not only take the water when inundations or a desire to change his hunting grounds compel him to migrate, but Mr. Bell avers that he sometimes takes a swim "merely for the purpose of enjoying the luxury of a bath." The male mole is exceeding fierce during the love season, and readily resents any individual of the same sex who should unhappily be paying his addresses to the same female as himself. Formidable pitched battles are fought, and much blood shed on such occasions, while the unfortunate object of affection is also somewhat roughly handled. The nest is generally situated at a considerable distance from the habitation; it is well constructed and compact, but its place of location is not always to be found indicated by a hillock. When the latter is present it exceeds in size that of an ordinary molehill. The nest is built "by enlarging and excavating the point where three or four passages meet and intersect each other." In one instance no less than two hundred and four wheatblades were counted by Geoffroy St Hilaire, and Le Court. From this circumstance alone, therefore, we can well comprehend the weight of those accusations which have from time immemorial been levelled against the mole. Some distinguished naturalists, and most prominently among them Mr. Bell, have endeavoured to advocate its cause, and to contend that after all the mole is not such a thievish villain as some have supposed. Without entering at any great length into this instructive controversy, we are inclined, all things considered, to take the view and state the case, as Professor Owen has succinctly put it, in the following words—"The farmer views the operations of the mole as destructive to his crops, by exposing and destroying their roots, or by overthrowing the plants in the construction of the molehills; his burrows, moreover, become the haunts of the fieldmouse and other noxious animals. The mole is also accused of carrying off quantities of young corn to form its nest; hence every means are devised to capture and destroy it, and men gain a livelihood exclusively by this occupation. Some naturalists, however, plead that the injury which it perpetrates is slight, and that it is more than counterbalanced by the benefit which it produces by turning up and lightening the soil, and especially by its immense destruction of earthworms and many other noxious animals, which inhabit the superficial layer of the ground, and occasion great injury to the roots of grass, corn, and many other plants. The soundest practical conclusion lies probably in the mean of these opinions, and the enlightened agriculturist, while he takes prompt measures to prevent the undue increase of the mole, would do well to reflect on the disadvantages which might follow its total extermination." The common mole is found in nearly all parts of Europe, but in Greece it is said to be scarce, while in the more northern counties of Scotland, and in the contiguous isles of Orkney and Shetland, it is stated to be altogether unknown.

THE THICK-TAILED STAR-NOSE (*Condylura macroura*). — The individuals of which this genus is composed, are closely allied to the true moles, not only in their general form, but also in their habit of life. Their dental arrangement is peculiar. Of the ten cutting teeth, six occupy the upper and four the lower jaw. The two central teeth of the superior row are remarkably broad, also somewhat triangular and curved anteriorly. The lower series slope forwards in an almost horizontal direction. There are no true canines, as usual; but the deficiency is sufficiently compensated by the presence of thirty grinding teeth, seven on either side of the upper, and eight on those of the lower. The anterior three of the superior series, or upper false molars as they are called, are small, conical, and more or less widely separated from each other, while the inferior false molars, five in number on either side, are irregularly serrated and trenchant. Several species have been described; but their differentiating characters do not appear to be very strongly marked. In all of them the muzzle is prolonged into a narrow proboscis, the naked extremity of which is furnished with a number of moveable cartilaginoid, styliform processes or caruncles, radiately disposed like the spokes of a wheel (fig. 17). All have

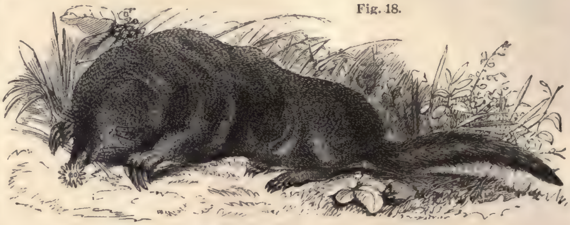
Fig. 17.



Snout of the Star-nose, or Condylura.

very minute eyes. The ears are destitute of conspicuous auricles; the feet are pentadactylous or five-toed; the tail is of moderate length, varying, however, in this respect with different species, and only loosely clothed with hair. In the Thick-tailed Star-nose "the head is remarkably large; the body is stout and short, and becomes narrower towards the tail, and the hind legs are consequently nearer to each other than the fore ones. The nose is rather thick, and projects beyond the mouth. It is naked towards its end, is marked with a furrow above, and terminates in a flat surface, which is surrounded by seventeen cartilaginous processes, with two more anterior ones situated above the nostrils, and a pair of forked ones immediately below the nostrils. The surfaces of these processes are minutely granulated. Some white whiskers spring from the side of the nose, and reach about half the length of the head. There are others not so long on the upper and under lips. The fur on the body is very soft and fine, and has considerable lustre. It is longer than the fur of the other two known species. Its colour on the dorsal aspect is dark amber brown, approaching to blackish-brown. On the belly it is pale liver brown. When the fur is blown aside it exhibits a shining blackish-grey colour towards its roots. It is longer behind the head and on the neck, than on the belly. The tail is narrow at its origin; but it suddenly swells to an inch and a half in circumference. It then tapers gradually until it ends in a fine point, formed by a pencil of hairs about half an inch long. It is round, or very slightly compressed, and is covered with scales about as large as those on the feet, and with short, tapering, acute hairs which do not conceal the scales. The hairs covering the upper surface of the tail are nearly black; those beneath are of a browner hue. The extremities are shaped almost precisely like those of C. longicaudata, only the palms and toes of the fore feet project beyond the body. The palms are nearly circular, and are protected by a granulated skin, like shagreen. The sides of the feet are furnished with long white hairs which curve in over the palms. The five toes are very short, equal to each other in length, and, together with the back of the hands, are covered with hexagonal scales. The fore claws are white, nearly straight, broadly linear and acute, convex above and flat beneath. The palms turn obliquely outwards, which causes the fourth claw to project rather farthest; but the third one measures as much, the second is shorter, and the first and fifth are equal to each other, and a little shorter than the rest. The hind feet are also turned obliquely outwards, and are scaly, with a few interposed hairs above, and granulated underneath. The sides are narrow, and present a conspicuous callous tubercle posterior to the origin of the inner toe. The hind legs are very short, and are clothed with soft brown hairs, a tuft of which curves over the heel. There are no hairs on the sides of the hind feet, like those which form a margin to the fore ones. The hind toes are longer than the fore ones, and are armed with more slender claws, which are white, awl-shaped, curved, and acute. They have a narrow groove towards their point underneath." The length of the body, not including the tail, is four inches and a quarter. This minute and accurate account is taken from Sir John Richardson's description of a specimen captured on the banks of the river Columbia, and all the examples hitherto received have been brought from North American districts. Fig. 18. represents a very closely-allied form. The generic name Condylura was originally given to these moles by the naturalist Illiger, who was misled by a figure which had been executed from a dried specimen, and consequently showed a knotted appearance of the tail. This irregularity of the tail unfortunately suggested to him the generic title now generally adopted; but the term *Rhinaster* proposed by Wagler, would have been, scientifically speaking, more correct.

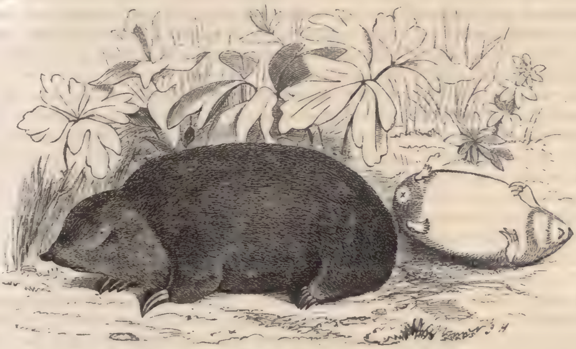
Fig. 18.



The Common Star-nose (Condylura cristata).

THE LUSTROUS CAPE MOLE (*Chrysochloris capensis*).—The members of this small genus are also pretty closely allied to the true moles. They differ, however, in some respects, and among the most important distinctions are those which concern the skeleton and teeth. Following the authority of De Blainville, there appear to be twelve cutting teeth, six above and six below, the two central teeth of the lower jaw being very minute. Of the grinding series there are probably twenty-eight, six of which come under the category of false grinders or premolars, two of them being superior and four inferior. The true molars have the form of triangular prisms with transverse crowns, which in the lower set are divided by corresponding grooves. All the species have the eyes covered by the integument, while there is no appearance of an external ear. The muzzle is short and broad, terminating in a slightly pointed and projecting nose. The fore foot or hand is apparently tetradactylous; but there are in reality five toes or fingers, the phalanges of the third and fourth fingers having coalesced to form a single gigantic digit. The latter is armed with a prodigiously strong claw, which is broad and arcuated, forming a powerful weapon for digging and burrowing in the earth; the fifth digit is particularly small and rudimentary. The hind feet are obviously pentadactylous, the several toes presenting the ordinary dimensions. The body is short and stout, and unprovided with a tail. The skeleton offers numerous points of interest. The skull exhibits a more conical form than obtains in the true moles. There are no less than nineteen pairs of ribs, whilst in one species as many as twenty have been counted. The sternum is provided with small concave lateral appendages; the first rib is unusually broad; the clavicles and the scapulæ are long and thin. The humerus is comparatively longer than that of the common mole, and at the lower part it is not only articulated to the radius and ulna, but also to a third bone, specially developed to strengthen the arm during the action of burrowing. This strange supplementary osseous appendage is supposed to represent one of the carpal elements of the wrist; be that as it may, the circumstance of these creatures' possessing a fore-arm consisting of three long bones, indicates an anatomical and morphological change altogether without precedent in this region of the mammiferous skeleton. The Lustrous Cape Mole or Chrysochlore—Fig. 19—is not quite so long as the common European mole. The fur is of a brownish colour, capable of reflecting irridescent hues of green and purple, which change to a copper or bronze tint; and thus we have brought before us, in the language of Cuvier, "the only known quadruped which exhibits any appearance of that splendid metallic lustre which adorns so many birds, fishes, and insects." The species under consideration is found at the Cape of Good Hope, but other kinds are obtained from the same locality, as well as from the neighbourhood of Mozambique.

Fig. 19.



The Lustrous Cape Mole or Chrysochlore.

Family II.—SORICIDÆ.

From a consideration of the moles we pass by a very natural transition to the Soricidæ, which are more commonly known as the shrews, or shrew-mice. They have a very general resemblance to ordinary mice; but while the latter have their front teeth formed for gnawing vegetable structures, the former are entirely insect-feeders, as in the case of the moles. The typical Soricidæ exhibit conspicuous eyes and ears, and the feet are not formed for burrowing in the soil, or, in other words, are non-fossorial. In some of the aberrant types we still recognize the peculiar talpine features, and so much so is this the case in the genus we shall here first elucidate, that it becomes almost a matter of indifference whether we class them as moles or shrews, or, on the other hand, altogether recognize them as a separate osculant group.

THE SHREW MOLE (*Scalops aquaticus*).—This species, in common with others of the genus Scalops, presents a stout, thickset, cylindrical body, the limbs being remarkably short. The pentadactylous feet and hands very closely resemble those of the common mole, especially the latter, which are also situated close to the auditory opening. The head terminates anteriorly in a movable snout, which is naked at the tip. The teeth are probably forty-four in number, but a considerable difference of opinion exists on this point. According to Professor Owen there are twelve incisors, four canines, sixteen false grinders, and twelve true molars; half of these severally belonging to either jaw. The eyes are extremely small and concealed by the fur. The colour of the hair is, generally speaking, of a greyish-black, approaching to brown in some regions, especially on the forehead, where it assumes a chestnut tinge. The length of the body is rather more than seven and a half inches, not including the tail, which is short, annulated, and very thinly clothed with hair. The shrew-moles are inhabitants of the low grounds and marshy districts bordering on the river Columbia, and the adjacent coasts of the Pacific. Sir John Richardson speaking of their habits says, that they resemble our common European mole, "in leading a subterranean life, forming galleries, throwing up little mounds of earth, and in feeding principally on earthworms and grubs. Dr. Godman has given a detailed and interesting account of their manners, particularly of one which was domesticated by Mr. Titian Peale. He mentions that they are most active, early in the morning, at mid-day, and in the evening, and that they are well known in the country to have the remarkable custom of coming daily to the surface exactly at noon. They may be taken alive by thrusting a spade beneath them and throwing them on the surface, but can scarcely be caught at any other period of the day. They burrow in a variety of soils, and in wet seasons are observed to retreat to the higher grounds. The captive one in possession of Mr. Peale ate considerable quantities of fresh meat, either cooked or raw, drank freely, and was remarkably lively and playful, following the hand of its feeder by the scent, burrowing for a short distance in the loose earth, and, after making a small circle, returning for more food. When engaged in eating he employed his flexible snout in a singular manner to thrust the food into his mouth, doubling it so as to force it directly backwards."

THE MUSK RAT (*Mygale moschata*).—This rather ugly-looking animal has few characters in common with the moles, unless we make exception in favour of the form of the body, the shortness of the limbs, and some other non-essential features. It possesses a long snout or proboscis which is very mobile, and usually more or less curved downwards. The eyes, though small, are comparatively distinct, while the short ears scarcely project beyond the fur. The arrangement of the teeth is somewhat peculiar, there being six incisors, four of which, that is, two above and two below, are very largely developed, and look like canines; of these, however, there are none. There are no less than thirty-eight grinders, twenty in the upper and eighteen in the lower jaw. The feet are pentadactylous, the digits being severally connected together by a membrane to facilitate locomotion in the water. The tail is about one-fourth shorter than the body, and compressed from side to side throughout, especially at the tip; it is thinly haired, but very scaly, being also provided with numerous glandular follicles, arranged in double series along the under surface. These organs secrete a fatty matter or kind of pomatum giving out a peculiar musky odour. The fur presents a dusky-brown colour. The musk rat is very common in the rivers and lakes of southern Russia, and more particularly on the banks of the Volga. According to Mr. Ogilby, "it does not appear to have been seen on dry land, and, indeed, it is broadly asserted that it never goes there, but wanders from lake to lake in fortuitous floods only. It is often seen swimming or walking under the water, and coming for air to the surface, where, in clear weather, it is apt to sport. Stagnant waters, shut in by high banks, are its favourite localities, and in such places it makes burrows some twenty feet in length. Its principal food is alleged to consist of fish, leeches, and the larvæ of water insects; but fragments of roots have been found in its stomach. Its pace is slow; but it does not seem to be torpid in winter, at which season it is often taken in nets. The holes which it makes in cliffs and banks have the entrance far beneath the lowest level of the water, and the animal works upwards, never, however, nearing the surface more than sufficiently high to secure itself from the farthest rise of the river. Fish, as we have seen, form part of its food; but the quadruped in its turn falls a victim to the pikes and *siluri*, whose flesh becomes so impregnated with the flavour of musk in consequence, as not to be eatable." Formerly a very considerable trade was carried on at Orenberg for the sale of these animals' skins and tails, which, from their extraordinary abundance, only realized a sale at the rate of twenty copecs per hundred—a sum equivalent to eightpence-three farthings, of English money.

THE ELEPHANT MOUSE (*Macroscelides typicus*).—This is perhaps the best known of the seven or eight species which constitute the members of the genus. Its name almost suggests a combination of the sublime and the ridiculous, for the only feature by which this tiny creature in any measure resembles the huge pachyderm, lies in the circumstance of its possessing an elongated proboscis-like snout, at the extremity of which there are two oblique perforations representing the nostrils. The base of the snout supports numerous long stiff hairs or whiskers. In regard to the teeth, there are ten incisors, six above and four below, no true canines, and thirty-two molars, that is, fourteen in the upper and eighteen in the lower jaw. The ears are large and thinly haired. The feet are pentadactylous and plantigrade, the digits corresponding to the thumbs in the fore-feet, and the great toes in the hind-feet being very short; the claws are thin and strongly incurved. The fur has a tawny-brown colour, gradually becoming whitish on the limbs. The length of the body is rather less than five inches, the tail being likewise three and a quarter inches long, a little swollen immediately beyond the root, and provided, in the males at least, with minute glandular follicles. This and some other species of so-called elephant mice live in south Africa. Their habits are diurnal, and they are frequently seen hunting for their prey amongst the roots of brushwood and bushes. On being discovered, however, their timidity soon shows itself, and they scamper off in hot haste; retreating either into their natural burrows, or beneath stones and similar places of security.

THE SOLENODON (*Solenodon paradoxus*).—The distinguished naturalist Brandt has employed this title to designate a remarkable animal forming a sort of gigantic shrew. It is an inhabitant of the island of St. Domingo, is covered with coarse fur, and possesses very long whiskers. Each jaw is armed with six incisor teeth, the two central ones of the upper series being very large and triangular, while the pair next outside the central ones of the lower jaw are elongated, conical, and hollowed out at the inner surface by a deep groove. These two pair assume the aspect of very powerful canines, but the latter have in reality no true representatives. The molars are twenty-eight in number, that is, seven on either side of each jaw. This singular creature is larger than our common brown rat, being upwards of twenty inches in length, including the naked or scaly tail, which measures nine inches. The eyes are small, the nose slightly proboscidiform, the ears also being only moderately developed. The sides of the head and neck, as well as the abdomen and feet, exhibit a faint yellow-browr colour, with an occasional mixture of a greyish tint.

THE COMMON SHREW (*Sorex araneus*).—Plate 6, fig. 21. The genus Sorex comprehends an extremely numerous series of individuals, and it has therefore been variously subdivided by different naturalists. Without, however, expressing any opinion as to the propriety of their arrangements, our object is to impart a definite and accurate knowledge of the more important forms, under whatever names they may be clearly recognized. Even the species under consideration has caused much controversy, but it is now very generally understood that the common shrew-mouse of the British isles is correctly indicated by the above combined generic and specific title. Among the characteristics which distinguish this form we may especially refer to the teeth, of which there are probably ten incisors, though on this point there seems to be considerable difference of opinion. They are "much produced; the upper ones curved and notched at the base, the lower ones almost horizontal." There are in all twenty-four molars or grinding teeth, but no true canines. The length of the body, not including the tail, is about two and a half inches. The fur exhibits a reddish tint on the back, which passes from the ordinary mouse-colour to a light-grey on the under surface of the belly. The snout is conical and pointed; the eyes and ears are small—the latter being scarcely visible—and furnished with two lobes internally. With regard to its habits Mr. Bell observes, that "the common shrew frequents dry situations, feeding upon insects and worms, in the pursuit of which its attenuated snout enables it to grub amongst the closest herbage, or under the surface of the soil; for which habits it is also adapted by its soft, short, velvety coat, and its extensible form. Like the mole and other insectivorous tribes, it is very impatient of hunger during summer; like that animal too it is excessively pugnacious, so that it is rare to see two of them together excepting in the act of fighting. If two shrews be confined in a box together, a very short time elapses before the weaker is killed and partly devoured. They not only destroy each other, but there is reason to believe that many of them are victims to the voracity of the mole." A friend also informed him "that, in a field which had always before been abundantly inhabited by shrews, scarcely one had been seen during the then present season; but that a colony of moles had occupied the district, to whose voracity he, with much probability, attributed the disappearance of the shrews." Touching the early history of this creature many curious superstitions were formerly held in this country respecting them; but though, as we have recently taken occasion to show, these follies do still exist in regard to certain animals, we are inclined to believe that, so far at least as the shrews are concerned, they have almost entirely passed away. The childish notion that lameness of the foot or some grave disease could result from the mere accidental passage of a shrew over that part of the body of another animal was really credited, and, absurdly enough, induced our intellectual peasantry to prepare a ridiculous charm, which they swore to be an unfailing antidote against these imaginary injuries. This preparation was called shrew-ash, and a twig or fragment of it constituted the remedy. The *modus operandi* in the manufacture of this ash is thus described by Mr. Gilbert White:—"At the south corner of the plestor or area, near the church, there stood about twenty years ago a very old, grotesque, hollow pollard-ash which, for years had been looked upon with no small veneration as a shrew-ash. Now a shrew-ash is an ash whose twigs or branches, when applied to the limbs of cattle, will immediately relieve the pains which a beast suffers from the running of a shrew-mouse over the part affected; for it is supposed that the shrew-mouse is of so baneful and deleterious a nature that, whenever it creeps over a beast, be it horse, cow, or sheep, the suffering animal is afflicted with cruel anguish, and threatened with the loss of the use of the limb. Against this accident, to which they were continually liable, our provident forefathers always kept a shrew-ash at hand, which, when once medicated, would maintain its virtue for ever. A shrew-ash was made thus:—Into the body of the tree a deep hole was bored with an auger, and a poor devoted shrew-mouse was thrust in alive, and plugged in, no doubt with several quaint incantations long since forgotten." Some other methods of cure were likewise had recourse to, but of these it is unnecessary to speak further. The shrew-mouse propagates very rapidly, the female bringing forth six or seven young ones at a birth. The nest is rudely constructed of grass and other vegetable materials, and is placed in superficial holes in the earth, especially amongst hedgebanks, the debris and snug recesses of which afford abundant security. An excess of these animals is wisely prevented by the agency of owls, moles, and weasels, and also, it would appear from the statements of several writers, by a special mortality which cuts them off by hundreds during the autumnal months. The immediate cause of this phenomenon yet remains to be explained.

THE WATER SHREW (*Sorex fodiens*).—This form is darker than the common shrew upon the back, and also, on the other hand, of a lighter colour beneath the belly, being in point of fact, quite white. The feet and tail are provided with conspicuous, but thinly set hairs. The ears and eyes are very small, the auricles being furnished with three internal lobes. It is also a somewhat stouter species, while, at the same time, it measures three and a quarter inches in length. The fur is very close, smooth, and downy—a circumstance which, together with an increased breadth of the feet, favours the development of its swimming propensities. Perhaps the best account of the habits of this pretty little animal, is that long ago recorded by Mr. Dovaston in the second volume of *Loudon's Magazine of Natural History*. Speaking of the behaviour of one of these shrews, he says—"It swam with great agility and freedom, repeatedly gliding from the bank under water, and disappearing below the mass of leaves at the bottom, doubtless in search of its insect food. It very shortly returned and entered the bank, occasionally putting its long sharp nose out of the water, and paddling close to the edge. This it repeated at frequent intervals from place to place, seldom going more than two yards from the side, and always returning in about half a minute. Sometimes it would run a little on the surface, and sometimes timidly and hastily come ashore, but with the greatest caution, and instantly plunge in again." This species has a pretty wide distribution throughout the British isles, being found in Devonshire, and also as far north as Scotland. The female brings forth six or seven young at a birth.

THE OARED SHREW (*Sorex remifer*).—This is a comparatively large species, and, like the two preceding, indigenous to the islands of Great Britain. Its body is rather more than three inches long, the tail also being two-thirds of the entire length of the animal. The last-named organ has a quadrilateral shape. It is flattened towards the tip, being also provided with stoutish hairs along the under surface. The fur is of a rich black colour, except at the lower part of the belly, where, in some specimens at least, it is greyish-black, and also of a yellow tinge towards the region of the throat. The snout is compressed, the eyes and ears are small, the latter being bordered by a fringe of whitish-coloured hairs. The teeth exhibit a rusty or chestnut hue at their tips—a peculiarity, however, not confined to any particular species. Like the water shrew, its habits are essentially aquatic.

THE INDIAN SHREW (*Sorex indicus*).—Though in general appearance this species closely resembles the common shrew, the size at once distinguishes it, being in this respect equal to our common brown rat. In virtue of a very strong musky odour, it imparts a peculiarly nauseous smell to every thing with which it may happen to come in contact. Some of the stories told of its powers of communicating odoriferous properties to particular objects, appear to be rather exaggerated. For example, we are informed that wine in a properly-closed bottle will become impregnated with a musky flavour, merely by the circumstance of this animal's passing over the exterior surface of the glass! Surely this savours a little of the imaginative. At all events, the little beast enjoys an unenviable credit on this score. It is better known by the name of the Indian musk rat.

THE AMERICAN MARSH SHREW (*Sorex palustris*).—This species is principally marked by the possession of an unusually long tail, combined with very short hairy ears which lie entirely concealed beneath the fur. The hairy covering exhibits a hoary black colour, except on the belly, where it is lighter and of an ash-grey tint, the texture throughout being dense, soft, and lustrous. The teeth are thirty in number; that is, four incisors and twenty-six molars. Sir John Richardson was the first to describe this shrew, and he obtained several specimens in British America during his explorations with the expedition under Sir John Franklin. With regard to its habits, he says that it "lives in the summer on similar food with the water shrew, but," he adds, "I am at a loss to imagine how it procures a subsistence during the six months of the year in which the countries it inhabits are covered with snow. It frequents the borders of lakes, and Hearne tells us that it often takes up its abode in beaver houses." The length of the body, not including the tail, is precisely three and a half inches.

FORSTER'S SHREW (*Sorex Forsteri*).—The shrew thus named appears to have been first noticed by Forster, and described by him in the sixty-second volume of the Philosophical Transactions. It resembles the oared shrew in respect of the quadrangular form of the tail, and in some other minor particulars. The length of the body is about two and a quarter inches. It is armed with thirty-two teeth, four being incisors and the remainder true and false molars. The snout is much attenuated; the whiskers are conspicuous, and the ears completely enveloped by the fur. The author of the "Fauna Boreali Americani," speaks of it as follows:—"This little animal is common throughout the whole of the fur countries to the sixty-seventh degree of latitude, and its minute foot-prints are seen everywhere in the winter when the snow is sufficiently fine to retain the impression. I have often traced its pathway to a stalk of grass by which it appears to descend from the surface of the snow; but a search for its habitation by removing the snow was invariably fruitless. I was unable to procure a recent specimen." And further on he says—"It is the smallest quadruped the Indians are acquainted with, and they preserve skins of it in their conjuring bags. The power of generating heat must be very great in this diminutive creature, to preserve its tender limbs from freezing when the temperature sinks forty or fifty degrees below zero."

SAVI'S SHREW (*Sorex etruscus*).—To the general observer of nature, the distinctions established between the numerous species of shrew may not at first sight appear very satisfactory, and it is partly on this account that we find it necessary to confine our attention to the more striking or better known forms. There is a little North American form, emphatically called the small shrew-mouse—the *Sorex parvus* of Say and Richardson—which is only two inches and three-quarters in length; but this specific title might perhaps with greater propriety be applied to the species under consideration; for Savi's shrew is not only believed to be the smallest in existence, but it is probably the tiniest of all living quadrupeds, excepting, of course, those which have not attained their adult or fully developed state. The body of Say's small shrew measures two inches and three-quarters, without reckoning the tail; whereas the little *Sorex etruscus* scarcely exceeds two inches and a half, two entire fifths of which measurement belong to the caudal appendage. It is an inhabitant of Italy and the northern coasts of Africa. Notwithstanding what we have here advanced, it will doubtless occur to our readers that some of the bats scarcely exceed this animal in length; although, if placed side by side with the pipistrelle, this bat would appear in all likelihood comparatively bulky.

THE BULAU (*Gymnura Rafflesii*).—The members of this and the two following genera offer such peculiarities as scarcely to entitle us to classify them with the Soricidæ, properly so called; and on the one hand, they neither sufficiently agree in their respective characters, so as to enable our associating them together under a separate family title, nor, on the other, are they clearly referable to the *Tupaiadæ;* yet, as they exhibit characters of a very mixed kind, we cannot at present, perhaps, do better than briefly record them in the order here adopted. The head of the bulau is much elongated and compressed from side to side, the muzzle being proboscidiform, obtuse at the tip, and continued forward a considerable distance beyond the lower jaw. The eyes are rather small, and the ears rounded, conspicuous, and naked. The body is stoutish posteriorly, and terminates in a long, smooth, scaly tail which supports a few thinly scattered hairs. The mass of the fur is soft; but from beneath this downy covering there projects a multitude of long harsh, bristle-like hairs, which are particularly numerous along the back. The limbs are well developed, and terminate in plantigrade pentadactylous feet, having the three middle toes longer than the other digits. The jaws are armed with forty-four teeth, which Professor Owen has divided into twelve incisives, four canines, sixteen false, and twelve true molars. They are equally distributed above and below. It is also worthy of remark, that the skeleton displays fifteen pairs of ribs and five lumbar vertebræ. In external form this animal approaches the American marsupials; but little or nothing is known of its habits.

THE RHYNCHOCYON (*Rhynchocyon cirnei*).—The eminent naturalist Peters has given this name to an extremely rare and very curious animal, discovered by him during his travels in the Mozambique. In certain particulars it resembles the bulau; but its snout is very much more prolonged, forming a conspicuous proboscis. The ears are moderately developed; but the eyes are comparatively large. The jaws are furnished with thirty-six teeth, somewhat irregularly disposed, there being only two incisors above while there are six below; and of the twenty-eight molars, the anterior pair in the upper series are sufficiently elongated to be at first sight mistaken for canines. The feet are plantigrade, tetradactylous, and armed with strong claws, the outer toe of the fore-feet being widely separated from the others. As in the preceding species, the hind feet are longer than the front ones. The tail is considerably developed, annulated, and sparingly clothed with hair.

THE HYLOMYS (*Hylomys suillus*).—M. Salomon Müller employs this name to designate a small and rare animal inhabiting the islands of Sumatra and Java, and living at a height of from twelve hundred to two thousand feet above the level of the sea. In the form of the skull and other cranial peculiarities, it appears to approach the members of the succeeding family; but the back of the orbit is not closed in by a bony ring, such as is found in that remarkable group. The teeth are forty-four in number; that is, twelve incisors, and thirty-two molars. The snout is prolonged forwards into a movable proboscis, which is directed a little downwards at the tip, where the nostrils are laterally disposed. The eyes are not large; but the ears are conspicuous, and thinly provided with hair. As in the bulau, the feet are pentadactylous, the three central digits being paramount, and the hind feet longer than the fore ones, the claws being sharp and strongly curved. The tail is particularly short, and but thinly clothed with hair. Very little is known respecting its habits. The teeth, however, indicate its insectivorous propensities.

FAMILY III.—TUPAIADÆ.

The Tupaias are here collected into a separate group, chiefly on account of several well-marked anatomical peculiarities. The most important of these consists in the presence of an osseous ring completing the posterior part of the orbit, and entirely circumscribing that cavity. In all other species of the order Insectivora, a communication exists between the orbits and the spaces occupied by the temporal muscles which act upon the lower jaw. In this, and in some other features, we observe a structural and morphological approach towards the insectivorous monkeys. Throughout the family we have an elongated head, which is very much narrowed towards the pointed muzzle, and at the extremity of this snout the semilunar nostrils are placed sideways. The ears and eyes are largely developed, the latter projecting sufficiently to enable the animals to see backwards almost in a straight line. The body is long and narrow, but provided with tolerably strong limbs, terminating in plantigrade, five-toed feet, the digits being armed with sharply-curved claws. All the species at present known are inhabitants of the Sunda islands, while some few have been found in Pegu and on the shores of the Indian peninsula. Their habits are diurnal and active, and from this circumstance they have always been associated with the squirrels by the native Malays.

THE JAVANESE BANGSRING (*Tupaia javanica*).—This species was first familiarly made known to naturalists by Dr. Horsfield, who during his travels in Java, in the year 1806, discovered numerous examples in the thickly-wooded forests of the province of Blambangan. The body being slender and compact is eminently fitted for active pursuits. The limbs are gracefully formed, imparting to the creature an easy and attractive appearance. The five-toed feet terminate in compressed and strongly-curved claws, which are firmly implanted into the somewhat swollen tips of the several digits. The tail forms a very conspicuous organ. It is fully as long as the body, having an almost uniform thickness from root to tip, and is clothed with regularly arranged hairs spreading out like those of the squirrel, but in a more limited degree. The fur consists, for the most part, of fine straight hairs closely applied to the skin; the back, neck, sides, and limbs being provided with a few longer, stouter, and darker-coloured hairs. The colour is of a greyish-brown, varying considerably at different spots, being lighter underneath the throat, chest, and belly. The head is narrowed anteriorly, and the eyes are particularly prominent. The bangsring and its allies appear to be very easily tamed; for a specimen of this genus which came under the notice of Sir Stamford Raffles, behaved itself like a pet spaniel, freely partaking of fruits and milk at the breakfast and dinner table, and scampering through the house with evident satisfaction.

FAMILY IV.—ERINACEADÆ.

The hedgehogs are readily recognized by their peculiar spinous integument and the remarkable power possessed by the more typical forms of rolling themselves up into a ball. This function is accomplished by the agency of a special development of the subcutaneous muscular bands, which are more or less developed in all the mammalia, forming in scientific nomenclature the muscular mass termed the *panniculus carnosus*. It is of such strength in these creatures, that in their doubled-up state they are capable of resisting almost any force which their enemies employ to unroll them, while the points of the setæ or spinous bristles inflict severe wounds upon the aggressors. In other respects the hedgehogs exhibit a general conformity to the insectivorous type. The muzzle is pointed, and prolonged beyond the lower jaw. The eyes and ears are tolerably conspicuous; the latter, however, are rather short. The feet are pentadactylous and armed with powerful claws; but the anterior pair are not specially modified for the purposes of burrowing like the moles. The tail is either very short or altogether absent.

THE TENREC (*Centenes setosus.*)—This animal differs from the ordinary hedgehogs both in respect of certain structural modifications, and also in the circumstance of its not being able to fold itself up into a ball; at least, its powers in this particular are extremely limited. The skin along the back is armed with a mixture of slender spines and bristles, and the body terminates abruptly behind without any trace of a tail. Some difference of opinion exists in regard to its dentition, owing, perhaps, to the fact that many of the specimens examined were quite young. In the adult state there are probably twelve incisors, four canines, twelve false and also twelve true molars—that is, forty teeth in all, equally divided between the two jaws, the canines being large and of a conical shape. The muzzle is much attenuated and proboscidiform. The tenrec is a native of the island of Madagascar; it is possessed of nocturnal habits, and passes three months of the year in a state of hybernation. According to the statements of Brugiere, the torpidity occurs during the period of greatest heat.

THE SOKINAH (*Echinops Telfairi*).—Under this title Mr. W. C. L. Martin has described, in the second volume of the Transactions of the Zoological Society of London, a kind of hedgehog which, like the foregoing, is an inhabitant of Madagascar. This animal is chiefly distinguished by the peculiarities of its dentition. It possesses ten incisors, four only of these occupying the upper jaw, the anterior pair being strongly developed and placed somewhat in front of the others; there appear to be four canines and but twenty-four molars—that is, five on each side of the upper, and seven on either side of the lower jaw; the crowns of the upper molar series are longitudinally grooved. Notwithstanding this dental arrangement, the sokinah cannot be said to differ very materially from the hedgehogs properly so called.

THE COMMON HEDGEHOG (*Erinaceus europœus*) Plate 6, fig. 20.—Most persons are familiar with this bristly urchin. All who have dwelt amid rural scenes or wandered along grassy hedgerows, have surely come in contact with our thorny friend. Yes! we shall deign to consider him a friendly individual, notwithstanding that he turns his back upon us and displays a *cheveux de frise* of little bayonets pointing in every conceivable direction. "Stay!" remarks one of my readers, "he is an enemy! To my certain knowledge, he has the credit of pilfering milk direct from the cow; he is a notorious stealer of apples and pears; he is an unsparing egg-poacher; and, moreover—which to my mind is the most cogent argument against him—he is a nasty, dirty little beast for, as old Pliny observes, he sprinkles himself all over with urine, for the express purpose of disgusting alike his tormentors and admirers, thereby necessitating a respectful distance! What do you say to that, Sir; will you still call him a friend?" Patience! impetuous reader, and you shall have my answer to your hypercritical censures upon this comparatively harmless animal. In the first place, with regard to the asseverations of the ancient historian of nature, they may safely be regarded as the gratuitous offspring of a fertile imagination, having, in point of fact, no other foundation than such as I have myself witnessed—namely, an involuntary expulsion of the fluid secretion on the part of the animal itself, when suddenly and violently alarmed. Secondly, in regard to the milking propensities, no one has ever yet witnessed the animal's indulgence of this refreshing experiment. Thirdly, with respect to his alleged carpological thefts, the body is but ill-adapted for climbing fruit-trees, though I admit, in a time of famine, he will not refuse apples and pears which have accidentally fallen to the ground; but the story to which you allude bears on its face the very stamp of absurdity, seeing it would have us believe that he not only ascends the tree, but, in the doubled-up state, voluntarily throws himself from the branches with sufficient precision to alight on the fallen fruits; these, in consequence, adhere to his skin, and, having unrolled himself, he hurries off with the desired booty upon his back! Fourthly, while I grant there is strong evidence of his being a poacher, you must bear in mind, before hastily pronouncing him to be a worthless character, that he only resorts to fowls' and pheasants' eggs when the supply of mice, snails, slugs, worms, and various insects, fail to satisfy his legitimate demands. On the whole, therefore, will you not be disposed to regard the hedgehog as an erring creature which does more good than harm? Let me direct your attention to its organization. On closely contemplating the structure of the hedgehog, we cannot fail to be struck with the marvellous adaptations provided for its comfort and security. "Deprived," says Mr. Bell, in his admirable history of British quadrupeds, "of all means of attacking its enemies, of defending itself by force, or of seeking safety in flight, this harmless animal is yet endowed with a safeguard more secure and effectual than the teeth and claws of the wild cat or the fleetness of the hare. Its close covering of sharp spines, which are hard without brittleness, sufficiently elastic to bear great violence without breaking, and fixed with astonishing firmness in the tough leathery skin, forms not only a solid shield to protect it from the effects of blows or falls, but a shirt of prickly mail sufficiently sharp and annoying to deter all but a few thorough-bred dogs, or a half-starved fox, from venturing to attack it. Immediately it is touched, or when it sees danger approaching, it rolls itself up into a compact round ball, by the contraction of the powerful muscles which cover the body immediately under the skin, and presents this impenetrable panoply, beset by innumerable spines standing out in every direction; and the more it is irritated or alarmed, the more firmly it contracts, and the more strongly and stiffly the spines are set. The strength and elasticity of this covering is such, that I have repeatedly seen a domesticated hedgehog in my own possession run towards the precipitous wall of an area, and, without hesitation, without a moment's pause of preparation, throw itself off, and, contracting at the same instant into a ball, in which condition it reached the ground from a height of twelve or fourteen feet, after a few moments it would unfold itself and run off unhurt." This last-mentioned phenomenon appears to give some clue to the ridiculous story of the hedgehog's voluntary falls from the branches of fruit-trees; at all events, the circumstance illustrates the well-known remark, that all widely-spread notions, however false and egregious, have their origin in some misinterpreted fact or other element of truth. Hedgehogs are readily tamed, and are, we believe, still kept by a few persons to eat up cockroaches and other noxious insects which infest our houses. Some aver that the flesh is good eating, but others dispute its merits in this respect; gipsies, at any rate, will cook and eat them. Without entering into a lengthened description, we may remark that a full-grown example measures about nine and a half inches, not including the rudimentary tail, which is only three-quarters of an inch long. The jaws are armed with thirty-six teeth—that is, eight incisors, six above and two below, and twenty-eight molars. The ears are short and oval, the eyes being bright and distinct. At the lower part of the body the spines degenerate, as it were, into mere bristles and stout hairs. The animal's habits are essentially nocturnal, and during the winter it remains in a torpid state, hybernating in the hollows of decayed trees and similar secure retreats. The nest is carefully constructed and rain-proof. In the early part of the summer the female produces from two to four young ones at a birth, their skin being covered with soft white elastic bristles, which in a very few days assume the ordinary hard spinous character.

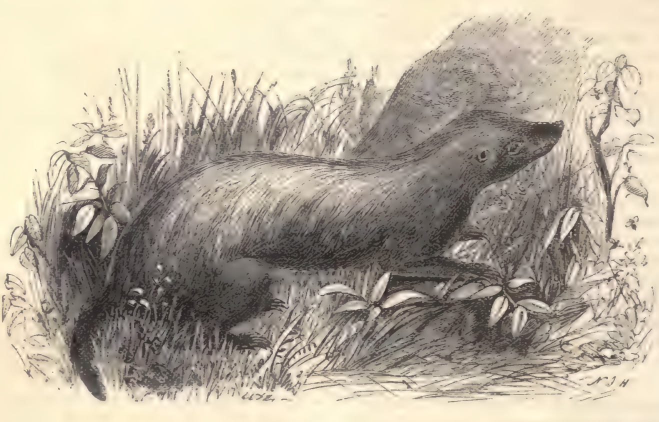
ORDER V.—CARNIVORA.

IN the arrangement of Cuvier, this eminently carnivorous group of animals constitutes the third family of those unguiculated mammals, which he associated together under the common title of Carnassiers. It is in these Carnivora, properly so called, that we observe the highest development of physical force combined with a purely zoophagous appetite. If, for example, we examine the skeleton of a lion, we shall find its mechanism specially adapted for the purposes of active pursuit, and for the employment of overbearing strength (Plate 33, fig. 105). The skull is short, broad, and massive, the hind part supporting at the vertex a longitudinal ridge or crest. The object of this median elevation is to afford attachment to the powerful temporal muscles which act upon and are inserted into the base of the lower jaw. The several bones of the face, and consequently those of the jaw, bear a remarkable contrast to the same osseous elements in the order previously considered; for, whereas in the latter we invariably notice a more or less marked attenuation towards the snout, in the lion and other typical Carnivora we find the facial bones terminating abruptly in a broad and short muzzle. The orbital fossæ are spacious, in order to accommodate the largely-developed eyes. That part of the temporal bone immediately connected with the function of hearing, is remarkably developed for the purpose of exaggerating the power of appreciating the most delicate sonorous vibrations—a circumstance obviously connected with the animal's nocturnal habits. From the internal surface of the occipital and parietal bones a peculiar shelf-like osseous plate projects, so as to divide the cerebral cavity into two or more parts; in the living state these osseous laminæ occupy the narrow interspaces between the principal divisions of the brain, and they are evidently intended to protect the great nervous centre from injury, during the violent and oft-repeated shocks to which the animal's habits necessarily expose it. The prodigiously strong jaws are armed with thirty teeth, twelve of these being well-developed incisors, six above and the same number below; the four canines are long and stout, having almost the appearance of tusks, while the majority of the molars are trenchant or cutting, two only being tuberculated, and these belonging to the upper series. In other Carnivora we find a larger number of tuberculated molars; and so uniformly is the balance of structure and function marked by this peculiarity, that the degree of tuberculation on the one hand, and of sharpness on the other, affords a very accurate indication as to the amount of carnivority possessed by any one particular species. According to Professor Owen, only four of the fourteen molars are true, the other ten being what are termed spurious, false, or pre-molars. The vertebral column of the lion is amazingly strong, yet, at the same time, very flexible; this combination of strength and elasticity being particularly well seen in the bones of the neck, where the first two segments, termed the *atlas* and *dentata*, are remarkably enlarged, the transvere processes of the former and the spinous process of the latter also affording admirable support and attachment to those muscles which act upon the occiput. There are thirteen ribs, but the number varies in different genera. The skeletal elements of the fore-limbs display evidence of great power. The scapula or shoulder-blade, is particularly broad; the upper end of the humerus, or arm-bone, R, is specially enlarged to give insertion to the strong muscles of the shoulder; the radius, S, and the ulna, T, together with the bones of the carpus, U, and metacarpus, V, are likewise correspondingly stout and powerful. In the lion and other *digitigrade* Carnivora—that is, those which walk on the tips of their toes—the ultimate digital phalanges, W, are curiously modified for the support and protection of their terrible claws. The extremity of each phalanx is invested by the hooked nail, the base being also deeply grooved and hollowed out for the lodgement and fixation of its root. With regard to the posterior pair of limbs, the femora, H, tibiæ, I, and fibulæ, K, do not exhibit any more remarkable features than those referable to an increased power; the calcaneum or heel-bone, L, is bulky, and with the metatarsals, M, directed vertically upwards. This arrangement facilitates the actions of springing and leaping. The digital phalanges, N, closely resemble those of the fore-feet. Such is a brief sketch of the more striking peculiarities seen in the skeleton of the lion, these characters being for the most part shared by all the more typical members of the order. The variations that occur in aberrant forms will be alluded to in the general remarks given at the head of each separate family.

FAMILY I.—URSIDÆ

The bears differ from the more typical Carnivora in several very important particulars. In the first place, they are plantigrade, applying the entire sole of the foot to the ground during progression; and in this respect, as well as in the circumstance of their nocturnal habits, associated with a comparative slowness of pace, we perceive a close alliance with the *Insectivora*. In the construction of the skeleton also, we find the bones less robust, while their mode of inter-articulation does not admit of the same degree of easy mobility which obtains in the cats. The elongation of the skull contrasts strongly with the short, massive cranium of the lion and tiger. The bears, properly so-called, usually carry forty-two teeth, twelve being incisive, four canine, sixteen spurious, and ten true molars; eight of the latter—that is, two on either side of each jaw—are tuberculated. The snout is prolonged and abrupt at the tip; it contains internally a movable cartilage. The ears are short, rounded, and erect. The tail is inconspicuous or feebly developed. Different members of the family are severally found inhabiting various parts of the globe. Their food is of a mixed character, scarcely anything being refused, whether animal or vegetable; this corresponds with the dentition, which, as we have seen, is even more frugivorous than carnivorous. The majority of the species are stout, thickset animals, and when attacked or excited, they frequently assume an upright attitude, fighting and striking with their powerful hands. They pass the winter in a semi-torpid half-starving condition, retreating for this purpose into dens and holes which they have excavated among the rocks. Fossil remains of bears have been found in the newest tertiary or pleistocene deposits, and in caverns referable to the subsequent glacial period. Among the several extinct forms at present known, the Great Cavern Bear (*Ursus spelæus*) appears to have been the largest, being probably about one-fifth more bulky than any species now living. Caverns containing these remains occur in England, at Kent's Hole near Torquay, in Devonshire; also in Essex, Norfolk, Yorkshire, and Cambridgeshire; as well as in various parts of Germany, Italy, and the south of France.

Fig. 20.



The Ratel (Mellivora capensis).

THE RATEL (*Mellivora capensis*).—Following out Cuvier's arrangement as far as possible, we place this interesting animal among the bears; yet, at the same time, we are fully aware that not only the ratel, but also several of the succeeding forms, exhibit, in a structural point of view, many important features in common with the Mustelidæ. On scientific grounds a distinct group might be formed, osculant between the two families; these refinements, however, as well as the more complicated classifications of some recent natural history authorities, would ill serve our present purpose. The ratel (fig. 20) is an inhabitant of the Cape of Good Hope and the region of the Mozambique. The body is about three feet in length, including the tail, which measures at least six inches; its height from the ground is scarcely one foot. The skin is very dense, the fur consisting of long, stiff, wiry hairs, which are greyish above, inclining to white on the head, but very dark or black on the belly; a white line or stripe separates these two colours. The head is smooth, short, and stout, with an abrupt muzzle, the auricles are small or rudimentary, being represented only by a slight elevation of the integument round the auditory opening. The teeth are thirty-two in number—that is, twelve incisive, four canine, a dozen spurious molars, and four true ones; none of these so-called grinding teeth are tuberculated, and this peculiarity alone constitutes a distinctive character. The limbs are short, terminating in semi-plantigrade pentadactylous feet, the digits of which are furnished with very powerful claws, and are admirably adapted for the purposes of burrowing. The ratel by this means grubs up the nests of wild bees, and is led to their haunts by watching the behaviour and return of these insects at evening-time. He is said also, like the native Hottentots, to listen to the note of the Honey Guide Cuckoo, which indicates the spot where the desired treasure is to be found. According to Peters, it also feeds on birds, rats, and snakes, a statement which entirely coincides with the opinion formed by a distinguished naturalist who, from a careful examination of the dentition, was led to express the following sentiments:—"It requires," observes Mr. Bennett, "the most positive evidence to convince us that an animal, the number and disposition of whose teeth correspond more closely with those of the cat than any other animal with which we are acquainted, and exhibit a carnivorous character scarcely, if at all, inferior to that which is evidenced by the same organ in the hyænas, should subsist entirely, as from these accounts we are led to believe, upon the petty rapine of a hive of bees and the honied produce of their comb. Still there exist such decisive marks of a diminished capacity for preying on animal food, in the thickset and clumsy form of its body, the shortness of its limbs, its partially-plantigrade walk, the structure of its muzzle, and even in the form of the teeth themselves, as to induce us to pause before we determine to reject the popular testimony as unworthy of credit, although we must regard it as doubtful on some particular points, and insufficient and imperfect on the whole." Messrs. Shaw and Hardwicke have described, in the Transactions of the Linnæan Society, another species of ratel (*Mellivora indica*) inhabiting the upper regions of the Indian peninsula. The tail of this form is shorter, and there is no appearance of the characteristic white band above mentioned.

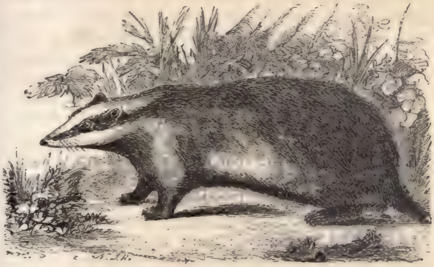
THE GLUTTON OR WOLVERENE (*Gulo luscus*).—As before remarked, we do not now discuss the nicely-balanced question as to whether the genera here allied together would be more appropriately placed among the weasels or cats. No injury is done to the harmony of zoological sequence by placing these animals side by side with the typical forms of the great ursine group, provided it is understood that we only employ the family title in its most comprehensive signification. The wolverene (Plate 2, fig. 36) is about the size of the common badger, and measures two and a half feet in length, not including the thick bushy tail, which is rather more than half a foot in length, the terminal hairs reaching four or five inches further. The body is strongly arched, especially along the back. The head is broad and pointed at the muzzle, the ears being short, rounded, and partly concealed by the fur. The jaws are provided with thirty-eight teeth—there being twelve incisors, four canines, sixteen false and six true molars, four of the latter belonging to the lower jaw. The limbs are short, and terminate in semi-plantigrade five-toed feet, the digits of which are furnished with powerful sharp claws. The fur exhibits a dark maroon or reddish-brown colour, becoming almost black as winter sets in; on either side a light reddish band, inclining to white, extends from the shoulder to the hip, but it is more conspicuous in some individuals than in others. The hair of the tail is black, the under part of the throat and chest being more or less marked with pale whitish streaks. In regard to the gluttonous habits of this animal, perhaps no creature has had its digestive capacities more wantonly exaggerated; and in these days it is well that our records of the instincts and habits of various creatures should be marked by the enunciations of sober truth, and the distinctions between fact and mere fiction sedulously maintained. The legendary tales of Ysbrandt, Olaus Magnus, Buffon, and many others, in which the ferocity, cunning, and voracity of the glutton are duly set forth, have too often been accepted as embodying actual truths. But by far the best account yet given of this animal is that by Sir John Richardson, who thus fairly estimates his stomachal powers and cunning propensities:—"The wolverene is a carnivorous animal, which feeds chiefly upon the carcasses of beasts that have been killed by accident. It has great strength, and annoys the natives by destroying their hoards of provisions and demolishing their marten traps. It is so suspicious that it will rarely enter a trap itself, but, beginning behind, scatters the logs of which it is built, and then carries off the bait. It feeds also on meadow-mice, marmots, and other Rodentia, and occasionally on other disabled quadrupeds of a larger size. I have seen one chasing an American hare, which was at the same time harassed by a snowy owl. It resembles the bear in its gait, and is not fleet; but it is very industrious, and no doubt feeds well, as it is generally fat. It is much abroad in the winter, and the track of its journey in a single night may be traced for many miles. From the shortness of its legs, it makes its way through loose snow with difficulty, but when it falls upon the beaten track of a marten-trapper it will pursue it for a long way. Mr. Graham observes that the 'wolverenes are extremely mischievous, and do more damage to the small fur trade than all the other rapacious animals conjointly. They will follow the marten-hunter's path round a line of traps extending forty, fifty, or sixty miles, and render the whole unserviceable, merely to come at the baits, which are generally the head of a partridge or a bit of dried venison. They are not fond of the martens themselves, but never fail of tearing them in pieces or of burying them in the snow by the side of the path, at a considerable distance from the trap. Drifts of snow often conceal the repositories thus made of the martens from the hunter, in which case they furnish a regale to the hungry fox, whose sagacious nostril unerringly guides him to the spot. Two or three foxes are often seen following the wolverene for this purpose.' The wolverene is said to be a great destroyer of beavers, but it must be only in the summer when those industrious animals are at work on land, that it can surprise them. An attempt to break open their house in the winter, even supposing it possible for the claws of a wolverene to penetrate the thick mud walls when frozen as hard as stone, would only have the effect of driving the beavers into the water to seek for shelter in their vaults on the borders of the dam. The wolverene, although it is reported to defend itself with boldness and success against the attack of other quadrupeds, flies from the face of man, and makes but a poor fight with a hunter, who requires no other arms than a stick to kill it." The geographical distribution of the wolverene is co-extensive with the length and breadth of the colder regions of the great North American continent, indications of its presence having been found as far north as Melville Island. The female produces from two to four young ones at a birth, which are clothed with a soft light cream-coloured fur.

THE AMERICAN BADGER (*Meles labradoria*).—This animal is also recognized by the names of the Brairo and Taxel. Mr. Waterhouse and others separate it from the badgers, properly so called; but, as it is closely allied to them in all essential particulars, we prefer to retain the above title. The dental elements correspond numerically with those of the common badger, but their carnivorous character is more marked, although the grinding surfaces of the molars are remarkably flat and even. The length and bulk of the body is similar to that of the glutton. The head is broad, and truncated posteriorly. The ears are short and round, the internal auditory bullæ being largely developed. The fur is coarse and short on the head and limbs, but everywhere else it is beautifully fine and silky, the individual hairs measuring several inches in length. Near the skin, the hair exhibits a purplish-brown colour; the free ends, however, are white, producing a pretty mottled grey appearance. A white band extends from the muzzle over the head along the middle line, gradually disappearing toward the shoulders. The limbs are stoutish, the fore-feet being furnished with strong light-coloured claws, which are longer than those of the common badger. In regard to its habits and geographical distribution, Sir John Richardson states that it "frequents the sandy plains or prairies which skirt the Rocky Mountains as far north as the banks of the Peace river, and sources of the River of the Mountains in latitude 58°. It abounds on the plains watered by the Missouri, but its exact southern range has not, as far as I know, been defined by any traveller. The sandy prairies in the neighbourhood of Carlton House, on the banks of the Sasketchewan, and also on the Red river that flows into Lake Winipeg, are perforated by innumerable badger-holes, which are a great annoyance to horsemen, particularly when the ground is covered with snow. These holes are partly dug by the badgers for habitations, but the greater number of them are merely enlargements of the burrows of the *Arctomys Hoodii* and *Richardsonii*, which the badgers dig up and prey upon. Whilst the ground is covered with snow, the badger rarely or never comes from its hole, and I suppose that in that climate it passes the winter from the beginning of November to April in a torpid state. Indeed, as it obtains the small animals on which it feeds by surprising them in their burrows, it has little chance of digging them out at a time when the ground is frozen into a solid rock. Like the bears, the badgers do not lose much flesh during their long hybernation; for, on coming abroad in the spring, they are observed to be very fat. As they pair, however, at that season, they soon become lean. This badger is a slow and timid animal, taking to the first earth it comes to when pursued; and as it makes its way through the sandy soil with the rapidity of a mole, it soon places itself out of the reach of danger. The strength of its fore-feet and claws is so great, that one which had insinuated only its head and shoulders into a hole, resisted the utmost efforts of two stout young men who endeavoured to drag it out by the hind legs and tail, until one of them fired the contents of his fowling-piece into its body. Early in the spring, however, when they first begin to stir abroad, they may be easily caught by pouring water into their holes; for, the ground being frozen at that period, the water does not escape through the sand, but soon fills the hole, and its tenant is obliged to come out. The American badger appears to be a more carnivorous animal than the European one. A female which I killed had a small marmot, nearly entire, together with some field-mice, in its stomach. It had also been eating some vegetable matters."

THE INDIAN BADGER (*Meles collaris*).—Some naturalists also regard this species as an aberrant form of badger, and they go so far as to place it with the digitigrade teledus! It is an inhabitant of Hindostan, and is commonly called by the natives the *Bhalloo-soor*, or Bear-pig. This title is by no means inappropriate, for, if we are to accept the description of Frederick Cuvier, the combination of swinish and ursine characters is very evident. It is similar to the European form in respect of bulk, but the tail is considerably longer, measuring nine inches. Mr. Johnson, in his "Indian Field Sports," says they "are marked exactly like those in England, but they are larger and taller, are exceedingly fierce, and will attack a number of dogs." The tame specimens kept in the menagerie of the governor-general at Barrackpoor, when irritated, gave out a peculiar kind of grunt, and stood up on their hind limbs to show fight precisely in the same manner as ordinary bears. The female appeared more docile than the male. Their movements were sluggish, and they always preferred vegetable to animal food, being particularly fond of bread and fruits. In the wild state, the Indian badger appears to be exceedingly savage. It occurs chiefly in the hilly districts, but is not very abundant anywhere.

THE EUROPEAN BADGER (*Meles taxus*), fig. 21.—Before noticing this creature's habits, we offer a few remarks on the principal characters which distinguish it, especially as we have designedly omitted entering upon minute details in our description of the two preceding aberrant forms. The body is broad and depressed, and is furnished with short powerful limbs, terminating in plantigrade, pentadactylous feet, whose digits are armed with long, powerful, fossorial claws. The fur consists of shaggy, coarse, bristly hairs, those on the belly touching the ground during progression. The head is remarkably long and attenuated in front. The ears are short, almost concealed, and placed well back. The mouth is provided with thirty-six teeth, of which there are twelve incisors, four canines, sixteen spurious, and four true molars, a moiety being appropriated by either jaw. The back is feebly curved, the tail being particularly short and only reaching down to the middle of the limbs. One of this animal's most remarkable peculiarities consists in the presence of a glandular pouch situated under the tail. This organ, which also exists in many other carnivorous animals, such as the skunks and weasels, secretes an unctuous oily material having a disgusting fetid odour. It is this circumstance which has suggested the common proverb, by which ill-savoured matters are said to "stink like badger." With regard to the varied colour of the fur, Mr. Ogilby gives the following minute description:—"The head of the badger is white, except the region beneath the chin, which is black, and two bands of the same colour, which rise on each side, a little behind the corners of the mouth, and after passing backwards and enveloping the eye and ear, terminate at the junction of the head and neck. The hairs of the upper part of the body, considered separately, are of three different colours—yellowish-white at the bottom, black in the middle, and ashy-grey at the point; the last colour alone, however, appears externally, and gives the uniform sandy-grey shade which covers all the upper parts of the body. The tail is furnished with long, coarse hair of the same colour and quality, and the throat, breast, belly, and limbs are covered with shorter hair of a uniform deep black." The European badger can scarcely be considered a common animal. It is by no means abundant on the continent, while in this country it appears to be rapidly approaching extinction. It has lost its ursine companion of former days, and in a few centuries more our persecuted friend will probably be better known by his fossil remains than by the smell of his greasy fur. At, or immediately succeeding, the close of the glacial period, he associated himself with several species of bears and hyænas, whose specific characters and habits are only known to us by the bony relics they have left in caverns and among the sands of time. A master hand has thus portrayed the habits of a living badger:—"Heavy, sleepy, and slothful, endowed with but a moderate degree of intellect, and with instincts dull and obtuse, it yet possesses a character and qualities which, if not peculiarly interesting and intelligent, are far from being disgusting and ferocious; and, if it do not boast the admirable sagacity and lively attachment of the dog, it is yet free from the cunning and rapine of the fox, and the fierceness and treachery of the cat. Its favourite haunts are obscure and gloomy. It retires to the deepest recesses of woods, or to thick coppices covering the sides of hills; and there with its long and powerful claws, digs for itself a deep and well-formed domicile, consisting of more than one apartment, the single entrance to which is by a deep, oblique, and even tortuous excavation. The general form of the elongated but robust body, the long taper muzzle terminating in a movable snout, the hard coarse hair, the loose and leathery skin, the low and plantigrade limbs, and the fossorial character of the claws—combine to fit the badger for a subterraneous abode, and to enable it to form that abode by its own labour. There it sleeps during the greater part of the day, coming abroad only for a short period in the evening or night to seek its sustenance, in the choice of which it exhibits as completely an omnivorous character as perhaps any animal with which we are acquainted. Its food, in fact, consists indifferently of various roots, earth-nuts, beech-mast, fruits, the eggs of birds, some of the smaller quadrupeds, frogs, and insects. Buffon states that it digs up wasps' nests for the sake of the honey—a fact which has received an interesting confirmation from the observation of a correspondent of *Loudon's Magazine of Natural History*, who seems, however, to attribute the destruction of these nests to the fondness of the badger for the larvæ of the wasp, as he says that the combs were found scattered about, but none were left that contained the maggots." Mr. Bell also observes, further on, in regard to the methods of taking this animal—"The favourite mode, and that which is perhaps the most successful, is by catching him in a sack placed at the entrance of his hole. The haunt of a badger being ascertained, a moon-light night is chosen when he is out feeding, and a small sack is placed within the mouth of the hole, fastened at the outside, with the mouth of the bag outwards, and having a running string round it. Two or three couples of hounds are then thrown off at some distance, and as soon as the badger hears their cry, he makes for his home with all speed, and runs into the sack, which closes behind him by the tightening of the running string at its mouth. Another method is by digging him out. This, however, is laborious and not always successful, particularly in sandy soils, in which the badger will easily foil the dogs which pursue him in his subterraneous passages, by throwing the earth back upon them, and blocking up their way, whilst he takes advantage of their loss of time, and makes his way to the surface." The nest of the badger is made of soft herbage, especially moss and grass. The female produces three or four young ones at a birth, the cubs being suckled for about five or six weeks, after which

Fig. 21.



The European Badger (Meles taxus).

they are permitted to help themselves. If captured while still young, they are readily tamed, and become very playful and agreeable companions. Notwithstanding, however, all that has been recorded in their favour, we do not ourselves either propose or recommend the rearing of a family of badgers. We heartily rejoice that the barbarous custom of badger-baiting has now completely passed away; but we still recollect an exhibition of this kind some twenty years ago, in a village in the county of Suffolk, since which time various societies have been established throughout the kingdom for the humane purpose of suppressing cruelty to noxious as well as inoffensive animals.

THE KINKAJOU (*Cercoleptes caudivolvula*).—By some authors the kinkajou is placed among the Viverridæ. Although its general aspect would at first naturally lead us to coincide with such an arrangement, yet its structural characters are evidently more intimately associated with the Ursidæ, and consequently we have introduced it in this place. Unlike the badgers, its head is short, rounded, and more resembling the apes, the muzzle being only very slightly produced. The jaws are furnished with thirty-six teeth, there being twelve incisors, four canines, twelve spurious, and eight true molars. The two anterior grinders on either side, above and below, are conical, the remainder being tuberculated. Their crowns are also flattened, those of the lower jaw having an oblong form, while the upper series are a little widened transversely. The tongue is slender and extensile. The body is cylindrical, a good deal curved posteriorly, and terminates in a long prehensile tail. According to Mr. Blyth, its capacity of employing the tail as a fifth limb is very limited; for he says—"One which I had an opportunity of studying as it ran about loose in a room, possessed the prehensile power of the tail in an extremely moderate degree, merely resting slightly on this organ, which it stiffened throughout its length, and never coiled in the manner of the Sapajous." Frederick Cuvier's figure represents the tail several times coiled upon itself. The feet are five-toed and plantigrade. The fur is thick and woolly, and of a golden-yellow brownish colour. The kinkajou is an inhabitant of the tropical parts of America, and of the principal West India islands. It is strictly arboreal and nocturnal in its habits, cautiously moving to and fro, and feeding on fruits, honey, milk, insects, eggs, small birds, and quadrupeds. Its disposition appears to be peculiarly mild and gentle.

THE BROWN COATIMONDI (*Nasua narica*)—Plate 11, fig. 38.—The genus Nasua includes two or more species of coati, of which this is probably the best known form. It is distinguished by the presence of white patches over the eye and muzzle. In the red coati, on the other hand, the snout is quite brown, the fur, generally, being of a rufo-fulvous hue. Without, however, insisting very strongly on these specific distinctions, we may observe that the coatis are characterized by the possession of an elongated head, the muzzle being extended into a movable proboscis. The superior border is particularly narrow, while the tip is slightly turned upwards. The ears are short, broad, and oval. The jaws are provided with forty teeth; that is to say, twelve incisives, four canines, sixteen premolars, and eight true molars. The canines are somewhat compressed, and have sharp points. The molars are comparatively small, three of the lower series being narrower than those of the upper. These animals are eminently arboreal in their habits, and consequently we find their plantigrade, pentadactylous feet admirably adapted for the purposes of climbing. The hinder feet are semi-palmate, and so freely do the tarsal bones move upon the leg, that when descending head-foremost they almost hang by them; their ordinary position, as maintained in walking, being nearly reversed. The toes are connected by an extension of the skin, and are provided with long, compressed, incurved claws. These they employ in digging up earthworms and various subterranean insects. They also feed upon slugs, snails, small quadrupeds, and more particularly upon eggs, birds, and various kinds of fruit, and vegetables. In short, nothing seems to come amiss, and their appetite is extremely vigorous. Before they actually devour the flesh of animals, they are careful to tear it in pieces and detach it. Without entering at any great length into the structure of the skeleton, a drawing of which is given in Plate 34, fig. 113, we may remark a general slimness of the several osseous elements of which it is composed. It may also be observed that the elongated head slopes very much backwards, while the degree of this animal's carnivority is shown by the aspect of the teeth already described, and more particularly by the sharp, prominent, occipital crest and ridge, which afford attachment to the powerful muscles of the neck—an arrangement enabling the animal to raise its head rapidly with great force, so as to impart to the jaws the necessary aid in tearing away the soft flesh from off the bones of its victims. We may likewise notice one other more remarkable peculiarity in the skeleton. It is seen in the curious fact that only a single bone or vertebral segment is found to represent what is termed the *sacrum*, while in the typical bears and carnivors, properly so called, there are always three or four conjoined osseous elements, and in the polar bear as many as seven. This phenomenon probably bears some relation to the arboreal habits of the coati, and this power of climbing requires, as we have seen, the utmost freedom of motion in the hinder parts of the body, while it forms an interesting contrast with the consolidated chain of bony elements witnessed in the slow-moving bears. The tail of the coatimondi is very long, and is marked externally by numerous annulations, depending upon the alternating dark and light-brown hairs which extend from the root to the tip. In other parts of the body the colours are more or less uniform, and, from the observations of the Prince of Neuwied, it would appear that the slight differences of colour occurring in the fur of various individuals, are entirely insufficient to indicate the correctness of those specific definitions which have hitherto been regarded as established.

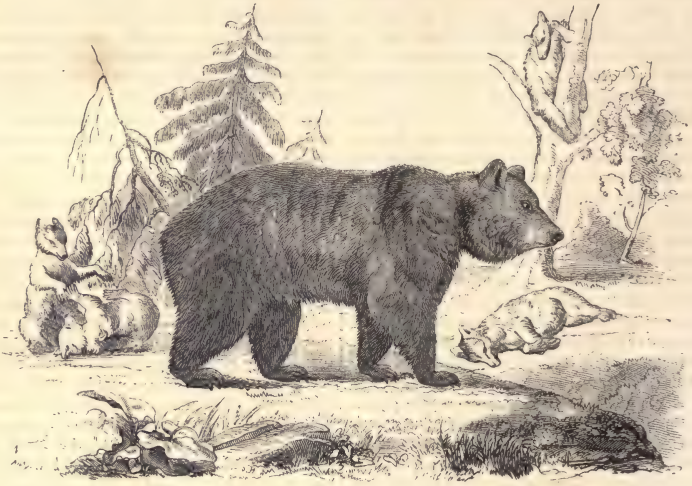
THE BINTURONG (*Ictides albifrons*) approximates very closely to the racoons, especially in the form of the skull. It is an inhabitant of the isles of Borneo, Malacca, Sumatra, and the western parts of Java, where it is also known as the Palm-civet or Musang. The head is short and pointed anteriorly. The body is clothed with long hair, which is generally of a grey colour, the tail and sides of the muzzle being black. The whiskers are extensively developed, forming a very conspicuous feature. The eyes are cat-like, with the pupil elongated from above downwards, the small and rounded ears being covered with a tuft of pencilled hairs. The jaws are armed with thirty-eight teeth; that is, twelve incisors, four canines, sixteen spurious, and six true molars, only two of the latter occurring in the lower jaw. The feet are entirely plantigrade and pentadactylous. The tail is remarkably long, stoutish throughout, more particularly at the root; it is also prehensile. According to Sir Stamford Raffles, the Binturong is slow and heavy in its movements, sleeping for the most part during the day, and at night wandering about in search of food. It appears to enjoy both an animal and vegetable diet, having however, a decided preference for the former. It climbs trees with tolerable facility, being greatly assisted by the strong prehensile tail.

THE PANDA (*Ailurus refulgens*) comes still nearer to the racoons, and consequently to the bears proper. It is an inhabitant of the Himalayas, between the snowy mountains and Nepaul. The body is stout, and covered with a soft thickly set fur. It is of a rich cinnamon colour on the back, fulvous posteriorly, and of a deep black hue beneath. The tail is as long as the body, tolerably thick throughout, especially at the root, and is annulated with dark brown bands. The head is short, broad, rounded, and clothed with whitish hair. The ears are small, arched, and pointed. The eyes are placed well forward. The jaws support thirty-six teeth; that is, twelve incisive, four canines, sixteen spurious, and four true molars. The limbs are short, the soles of the plantigrade five-toed feet being furnished with fine downy hairs. The claws are compressed, curved, retractile, and very sharp. Altogether, this animal is a handsome species. Respecting its affinities with certain allied forms, General Hardwicke states, that the peculiarities "on which its rank as a genus depends are striking and prominent; but its disposition in a natural series is still obscure, as it resembles in several characters the individuals of that subdivision of digitigrade Carnassiers, from which it differs essentially both in its teeth and in its plantigrade walk. Among the peculiarities of our animal are to be noticed, the great breadth of the rostrum and the singular structure of the teeth; but the most remarkable character, and that on which its distinction principally depends, is the form of the projecting points of the posterior grinders. This character, as far as our observation extends, is peculiar. It does not exist, except in a small degree, in any other genus of carnivorous quadrupeds." Comparing it with the genera *Nasua* and *Procyon*, he adds —"These differ essentially in the lengthened form of the head and in the extended rostrum, which is terminated by a flexible rhinarium. They also differ in the number, character, and distribution of the grinders. Nasua and Procyon have in both jaws six grinders, of which the three anterior are false; and of those which follow, none of the points even in the adult state exhibit the truncation above described." The habits of the Panda are strictly arboreal, the animal being particularly abundant in the neighbourhood of running streams and mountain torrents. It utters a peculiar cry resembling the syllable *wha*, and is consequently sometimes called by the natives the *Chitwa*. Its food consists chiefly of small quadrupeds and birds.

THE RACOON (*Procyon lotor*)—Plate 11, fig. 37—is characterized by the possession of an acute fox-like muzzle, associated with an attitude thoroughly ursine and plantigrade. During progression, however, the heel is slightly elevated. The posterior part of the head is more or less rounded. The ears are oval and a little pointed. The eyes are large and penetrating, having spherical pupils. The nose is soft, naked, tapering, and projecting considerably beyond the mouth. The jaws carry forty teeth; that is, twelve incisors, four canines, sixteen spurious, and as many as eight true molars. The body measures about two feet in length, exclusive of the tail; but it stands low, the back being scarcely a foot from the ground. The limbs are short and narrow, when compared with the preceding genera. The feet are pentadactylous, the digits being clothed and armed with strong falciform claws. Its tail is about ten inches long, and annulated by alternating bands of dark, black, and whitish hair, the latter being thick and much elongated. The fur is for the most part of a greyish-brown colour. On the head a brownish-black streak runs down the central line from between the ears to the tip of the nose, and on either side, below the eyes, there is an oblique patch of a similar colour. Over the eyebrows, and towards the muzzle, the hair is whitish. This is also the case with the ears. The whiskers are well developed. Under the belly the fur is much lighter than on the back. The Racoon has an extensive range over the upper parts of the North American continent. In regard to its habits, Sir John Richardson thus speaks of it:—"In the wild state it sleeps by day, comes from its retreat in the evening, and prowls in the night in search of roots, fruits, green corn, birds, and insects. It is said to eat merely the brain, or suck the blood of such birds as it kills. At low water it frequents the sea-shore to feed on crabs and oysters. It is fond of dipping its food into water before it eats, which occasioned Linnæus to give to it the specific name of *lotor*. It climbs trees with facility. The fur of the Racoon is used in the manufacture of hats, and its flesh, when it has been fed on vegetables, is reported to be good."

THE BROWN BEAR (*Ursus arctos*).—Almost every one is familiar with this common species, which has a very wide geographical distribution over the northern half of the eastern hemisphere, extending from Spain and the west of Europe, to the extreme eastern parts of Asia and the islands of Japan. It is also now generally believed that the Barren-ground bear is only a variety of this species—an opinion in which we are disposed to acquiesce; and if this persuasion be correct, *Ursus arctos* must be considered an American as well as European species, which would give it a range coextensive with the circuit of the globe. As the name indicates, the general colour of the fur is brown; but it is subject to a great variation of tint, partly depending upon age and partly also on locality—circumstances which have given origin to several well-marked varieties. In the young state the texture of the hair is woolly; but it becomes firm and even in the adult condition. The whitish bands seen on the neck and sides of the head in the Siberian variety of this bear, are, it would seem, merely the permanent indications of the pale collar which is commonly more or less marked in young specimens of the European form. Like all the true ursine types of structure, the common brown bear possesses a stout bulky frame and powerful thick limbs (fig. 22). The forehead is slightly convex, while the ears are short. Its habits are solitary. The flesh is very good eating, especially when the animal is young. The fur is valued everywhere, and more particularly by the Laplanders and the Kamtchatkans, to whom, Mr. Ogilby remarks, "it gives the necessaries and even the comforts of life. The skin, we are told, forms their beds and their coverlets, bonnets for their heads, gloves for their hands, and collars for their dogs, while an over-all made of it, and drawn over the soles of their shoes, prevents them from slipping on the ice. The flesh and fat are their dainties. Of the intestines they make masks or covers for their faces to protect them from the glare of the sun in the spring, and use them as a substitute for glass by extending them over their windows. Even the shoulder-blades are said to be put in requisition for cutting grass." As a source of sport, it was in early times the custom for English sovereigns and nobility to assemble together to witness the baiting of this unfortunate animal. We rejoice to know that those barbarous customs have long since passed away, and those who wish to indulge in a fairer and more legitimate amusement must betake themselves to the mountains and well-wooded districts of Europe and Asia, where they will find ample opportunities for developing their skill and courage, and, at the same time, confer a positive boon upon the inhabitants of many an outlying, lonesome, hill-begirt village. Although the behaviour of these animals is far less alarming than that of lions, tigers, and their congeners, yet their pursuit is by no means unattended with danger, and it requires great courage to attack them. Among the many interesting stories which have from time to time appeared respecting encounters with this animal, we are not acquainted with any more daring or desperate than those which have been recorded by Mr. Atkinson in his attractive work entitled "Oriental and Western Siberia." While in the neighbourhood of the celebrated Tsaravo-Nicholiovsky gold mine, two men, one of them being a skilled hunter, succeeded in springing a bear. "The hunter fired, and the ball struck, but not in a vital part. In an instant the wounded animal charged. The other man, who was less experienced, reserved his shot until within twenty paces. The rifle missed. At once the brute raised himself on his hind legs, and tearing the earth beneath him, rushed on his first assailant, striking him down with a blow that stripped his scalp, and turned it over his face. Then seizing his arm, he began to gnaw and crush it to the bone, gradually ascending to the shoulder. The man called to his companion to load and fire; but the fellow, when he saw his friend so fearfully mangled, ran away and left him to his fate. Late in the evening he reached the gold mine and reported what had happened; but it was too late to

Fig. 22.



The Brown Bear (Ursus arctos).

make any effort in behalf of the mangled hunter. The officer ordered a large party out at day-light the next morning with the coward for a guide. He took them through the forest to the spot where the encounter had taken place, of which there still remained ample evidence; but no remains of the victim were met with, except some torn clothing and his rifle. By the state of the grass it was evident that the man had been carried off into the thick forest. A most diligent pursuit was therefore made. Sometimes the track was lost; but the pursuers of the bear were too well skilled in wood-craft to be foiled, and at length discovered his larder. He had dragged the hunter into a dense mass of wood and bushes, and, to render the place still more secure, had broken off a quantity of branches and heaped them over his body. These were quickly stripped off, when, to their great surprise, they found the man, though frightfully mutilated and quite insensible, still living! Two long poles were immediately cut, to which saddle-cloths were secured in the middle. One horse was placed in front, another at the back, and the ends of the pole secured to the stirrups, thus forming a very easy conveyance. The sufferer was placed upon the saddle-cloths, and carefully propped up, and then began the painful march back as fast as possible. On their arrival at the gold mine he was taken direct to the hospital. The doctor dressed his wounds, and administered all that medical skill and kindness prompted. His patient survived, but long remained unconscious of everything around him. After more than two months had elapsed a slight improvement took place, and his reason appeared to be restored. His first question was about the bear, and then he referred to his own defeat. He spoke of nothing else, and was constantly asking for his rifle to go and kill 'Michael Ivanitch' (the bear). The medical men thought his mind seriously affected. As he gained strength there arose in him so great a desire to have another combat with his powerful and ferocious enemy, that it was considered necessary to place him under some restraint. Summer had passed over, and autumn had arrived; the sun had scorched the foliage, changing it into golden and crimson hues, and as it was now thought the poor lunatic had forgotten his adventure, less vigilance was exercised towards him. The opportunity was not lost; for he secretly left the hospital, and started off for his cottage. All the family being absent, except some young children, he was enabled to secure his rifle and ammunition, and provided himself with an axe and a loaf of black bread, which he stowed in his wallet. Thus armed and provisioned, he left the village in the evening without having been seen, except by the children, and was soon lost to them in the forest. When it was discovered that he had escaped, people were sent out in various directions to seek him; but they returned without success. More than a week passed over, during which nothing had been heard of him, when one day he walked into the hospital, carrying the skin of a huge bear on his shoulders, and throwing it down exclaimed, 'I told you I would have him.' This man was a fine old hunter. It was not a spirit of revenge which prompted him to this daring act. The fact was he could not brook the idea of a defeat. Now his reputation was re-established, he was happy. His health was again restored; nor was this the last bear that fell before his deadly rifle." Not only do the men of these regions courageously attack bears, but women also take to hunting, one of them having obtained an extraordinary reputation for her skill and daring. Thoughout Siberia, Bruin is said to have no more intrepid enemy than the damsel, Anna Petrovnaia! The closing scene of one of her expeditions is thus described by Mr. Atkinson:—"As she was creeping cautiously forward, out rushed the bear with a loud growl, about twenty yards in front. Quickly she threw forward the prongs of her rifle, dropped on one knee, and got a good sight of the animal staring at her, almost motionless. She now touched the trigger, there followed a flash, a savage growl succeeded, then a struggle for a minute or two, and her wish was accomplished—the bear lay dead." Since this event, we are informed that she has destroyed no less than sixteen bears! Here we would willingly quit the subject, but cannot do so without also recording the most desperate encounter probably ever placed on record. This took place not far from the district in which the poor hunter above mentioned was so terribly mangled. One afternoon, says Mr. Atkinson, a Cossack officer "was quietly strolling through the forest, alone and unarmed, botanizing by the way, when, at a distance of about eight versts from the gold mine, he came out of the forest into an open glade, on which stood some single trees. Almost immediately on entering this spot, he observed at a distance of two hundred paces a she-bear and her two cubs playing together. The moment she became aware of his presence, she uttered a savage growl, drove her young ones into a tree for shelter, and mounted guard at the foot of it to defend them. The Cossack retreated into the wood to provide himself with a weapon, having determined to carry off the cubs. The woodmen had been cutting timber, and from the stems of several young birch trees lying on the ground, he selected part of a strong one, nearly four feet in length, tried its quality against a tree in a succession of smart blows, and then club in hand, retraced his steps. As soon as the old bear observed his approach she began to growl furiously, moving to and fro with an uneasy motion at the foot of the tree. He slowly and steadily advanced, when within about a hundred paces her growl became more savage, and her actions showed that she intended mischief. Nevertheless he quietly moved on, his keen eye steadfastly fixed upon her. The ground was a fine grassy turf, with no shrubs or bushes to impede his movements or entangle his feet. When within about fifty paces, she made a savage rush that would have daunted most men; but he firmly stood his ground, waiting her nearer approach. At this moment the cubs began to whine, and she trotted back towards the tree in increased fury. The Cossack followed, and when she turned round, they were face to face, within twenty paces of each other. There was now no retreat. The brute eyed him keenly for two or three minutes, as if calculating his strength; he returning her gaze with as searching scrutiny. Presently she made a second rush, her eyes glaring like balls of fire. At a few paces from her enemy she rose on her hind legs, intending to give him a settler with her powerful paws, or to clasp him in her savage embrace; but on the instant, he made a sweep with his club, and dealt a blow that toppled her over. She was up again in a second, and ready for action, but another blow laid her prostrate. This added to her ferocity, and it at once became a close encounter of the most deadly and savage character. Many rounds were fought, her antagonist keeping clear of her paws. At last the blows began to tell on her courage. She endeavoured to get behind him; but his cudgel met her at every turn, and was so well wielded that whenever within reach she received a stroke which drove her back step by step, till both came under the tree. Here the fight was renewed with increased fury, and every time the cubs whined she made her attack with redoubled violence. The battle continued to rage furiously; but the blows from the staff fell so fast, and were applied with so much force, that at last she began a retreat towards the forest, the skirts of which she entered; but the moment her brave assailant moved a step towards the tree, she would rush out, taking especial care, however, not to come within his reach. The cubs remained in the branches the sole spectators of this extraordinary scene; nor could the Cossack officer devise any plan by which he could get them down. At their respective posts the combatants stood, he guarding the cubs, and the mother standing at the edge of the forest. At this time a woodman returning to the gold mine, rode into the glade. He was instantly hailed, and rode towards the tree; but when he heard the growls, and beheld the bear, then in her most savage mood, his natural impulse to bolt was only checked by the fear of a birching promised by his superior. He was ordered to dismount, and take from his saddle the *zumka* (large leathern bags), and open them; then to climb the tree, and bring down the cubs. The man was soon up among the branches, secured a cub, brought it down, and then tied it safe in the bag. The other was also quickly placed beside it in the other bag. During these operations the mother rushed at the Cossack, and was several times knocked down by his weapon. The peasant was now ordered to place the bags on his horse, and lead the way to the gold mine, the Cossack covering the retreat, and beating off the enemy at every charge. After a walk of nearly two hours, they reached the village, the bear keeping close up with them. As they went through the forest, she made many charges, but each time was laid prostrate, and finally would not approach within striking distance. When they reached the village the Cossack officer hoped to secure the dam; but after following them to the cottages, she returned to the forest, and was never seen again. The cubs were kept, and became great pets with the people. Even the hardy hunters of Siberia consider this a most daring feat, wondering at the power, and admiring the cool courage of the man who accomplished it." Mr. Atkinson records many other pleasing adventures and interesting facts connected with the Siberian bear. Like most other quadrupeds, this animal has a great fear of fire; but when pressed with hunger he will, in order to seize any person who may be reposing by a fire in fancied security, deliberately enter some stream, and having saturated his fur with water, put out the fire by rolling over it, and then secure his victim. Bears have been known, even in the wild state, to show attachment to young people; and the same author mentions an instance where two young children, two and four years of age respectively, had wandered from a hay-field where their parents were at work, and when the father and mother went to look for them, lo and behold! one was sitting on a huge bear's back, whilst the other was feeding the beast with wild fruit! The children readily came away at their parents' alarming calls, and Bruin seemed vexed to part with his joyous little companions.

THE SYRIAN BEAR (*Ursus syriacus*). — This appears to be a well-marked species; the fur is of a fulvous or light-brown colour, whilst on the upper part of the neck there is a mane of thick rigid hairs, which increase in length towards the shoulders, terminating posteriorly about the centre of the back. The Syrian bear, though often feasting upon animals, is said to be particularly partial to certain kinds of vegetable food, and more especially to the chick-pea, *Cicer arietinus*, entire crops being laid waste by its ravages.

HORSFIELD'S BEAR (*Ursus isabellinus*) is an inhabitant of the entire Himalayan chain of hills, and, like the foregoing species, is of a pale fulvous colour; it is, however, quite a distinct form. According to Dr. Horsfield, it resembles "the European bears in its structure, as far at least as can be determined from the parts which have been preserved in the specimen (procured from Nepaul). Among these, the claws afford the best means of comparison; they are small, obtuse, and straight; while those of the Asiatic bears (*U. thibetinus*, *U. labiatus*, and *U. malayanus*) are large, strongly-curved, acute, and fitted for climbing."

THE SLOTH BEAR (*Ursus labiatus*) exhibits so striking a resemblance to a sloth, that when it was first made known to Europeans, it was actually described as a species of Bradypus. Some confusion has arisen respecting it, partly perhaps on account of the varied nomenclature by which it has been indicated; thus it is called the Ursine sloth, the Labiated bear, the Jungle bear, and one author denominates it the Bengal bear. It is an awkward, unwieldy animal. The body is clothed with thickly-set, black, shaggy hair, which becomes much longer when the animal is old. The head is depressed and attenuated in front, the nasal cartilage being movable and extensile. The lips are capable of protrusion, this being especially the case with the lower one. Captain Thomas Williamson, in his "Oriental Field Sports," remarks that "the Bengal bear is distinguished by the deep black colour of his hair, and by a crescent of white hair, like a gorget, on his breast. The hind legs are shorter, and the paws flatter and longer than those of the European breed; his pace is more shuffling, awkward, and laboured, though quick enough to overtake a man on foot; and his hair is long and thinly scattered over his body. He is remarkably active in climbing; frequently, when not more than a month old, a cub will ascend to the shoulder of his keeper with great ease, and descend again, stern foremost, with equal adroitness." Its food consists chiefly of fruits, honey, and white ants, of which latter it appears to be particularly fond. When the Bengal bear "finds a nest of any kind of ants, but especially white ants, he is in his glory! he tears the whole burrow, licking up all the clusters he can get at, and lying with his tongue out to entice the little prey into his mouth. By this means, he no doubt often obtains an ample meal; for I think I may with propriety assert that frequently a bushel of white ants may be found in the same nest. The presence of bears in the vicinity of a village is generally pretty well known by the nature of the covers, and their having been, perhaps time out of mind, regular visitors; sometimes, however, they change their haunts, on which their neighbourhood is commonly first discovered by the ant-hills and burrows near the sides of roads being found in a state of destruction." Their food, however, does not appear to be confined to insects and fruit, for the same naturalist observes that they will attack and devour quadrupeds, and even man himself. He gives the following sad account of their behaviour:—"It has often been in my way to see the operations of bears; and I am confident that no animals exist more cruel, more fierce, nor more implacable than they are! Such as have suffered under their brutality have in all instances within my knowledge borne the proofs of having undergone the most dilatory torments. Some have had the bones macerated, with little breaking of the skin; others have had the flesh sucked away into long fibrous remnants, and, in one instance, the most horrid brutality was displayed. While stationed at Dacca, I went with a party several times to the great house at Tergong, distant about five miles from the town. I had on several occasions seen bears among the wild mango topes, and did not consider them as being so dangerous, until one day as I was returning with a friend from hunting some hog-deer, we heard a most lamentable outcry in the cover through which we had to pass. Having our spears, and being provided with guns, we alighted, not doubting but a leopard had attacked some poor woodcutter. We met a woman whose fears had deprived her of speech, and whose senses were just flitting. She, however, collected herself sufficiently to pronounce the word *bauloo*, which signifies a bear. She led us with caution to a spot not more than fifty yards distant, where we found her husband extended on the ground, his hands and feet, as I before observed, sucked and chewed into a perfect pulp, the teguments of the limb in general drawn from under the skin, and the skull mostly laid bare, the skin of it hanging down in long stripes, obviously effected by their talons. What was most wonderful was, that the unhappy man retained his senses sufficiently to describe that he had been attacked by several bears, one of which had embraced him about the head and bit at his arms and legs, seemingly in competition for the booty. We conveyed the wretched object to the house, where, in a few hours, death relieved him from a state in which no human being could afford the smallest assistance!" The Bengal bears appear to be abundant on the eastern side of the Ganges, but of late years their number has been very considerably reduced by the skill of our Indian officers, who are notoriously fond of the sport of hunting.

THE MALAYAN SUN-BEAR (*Helarctos malayanus*) is also characterized by the possession of a deep jet-black fur, the hairs of which are, however, comparatively shorter than obtains in the foregoing species, the breast being marked by a white patch of a heart-shaped colour. In the Bornean bear, which we take to be a mere variety of this species, this patch is of a fulvous colour, and likewise deeply notched in front. The Malayan bear feeds chiefly on vegetables and honey, and is said to evince a special predilection for the young shoots of cocoa-nut trees, to which it proves very destructive. The length of the body is about four and a half feet. This animal appears to be easily tamed, if taken whilst still young. Sir Stamford Raffles' account of one in his possession might almost induce us to desire a similar companion. He says, it "was brought up in the nursery with the children, and when admitted to my table, as was frequently the case, gave a proof of his taste by refusing to eat any fruit but mangosteens, or to drink any wine but champagne. The only time I ever knew him to be out of humour was on an occasion when no champagne was forthcoming. It was naturally of an affectionate disposition, and it was never found necessary to chain or chastise him. It was usual for this bear, the cat, the dog, and a small blue mountain bird or *lory* of New Holland, to mess together and eat out of the same dish. His favourite playfellow was the dog, whose teasing and worrying was always borne and returned with the utmost good humour and playfulness. As he grew up he became a very powerful animal, and in his rambles in the garden he would lay hold of the largest plantains, the stems of which he could scarcely embrace, and tear them up by the roots." Of a tame specimen of the Bornean variety, Dr. Horsfield also gave the following interesting account:—"The *Helarctos* readily distinguishes the keeper, and evinces an attachment to him. On his approach it employs all its efforts to obtain food, seconding them by emitting a coarse but not unpleasant whining sound. This it continues while it consumes its food, alternately with a low grunting noise; but if teased at this time, it suddenly raises its voice and emits at intervals harsh and grating sounds. Our animal is excessively voracious, and appears to be disposed to eat almost without cessation. When in a good humour, it often amuses the spectators in a different manner. Calmly seated in its apartment, it expands the jaws and protrudes its long and slender tongue as above described. It displays on many occasions not only much gentleness of disposition, but likewise a considerable degree of sagacity. It appears conscious of the kind treatment it receives from its keeper. On seeing him, it often places itself in a variety of attitudes to court his attention and caresses; extending its nose and anterior feet, or suddenly turning round exposing the back, and waiting for several minutes in this attitude with the head placed on the ground. It delights in being patted and rubbed, and even allows strangers to do so; but it violently resents abuse and ill-treatment, and, having been irritated, refuses to be courted while the offending person remains in sight." This unfortunate animal died suddenly one summer's morning, after having gorged itself with a too hearty meal.

THE BLACK BEAR (*Ursus americanus*) is a well-known species, inhabiting the American continent from the shores of the Atlantic to the Pacific, and from the Arctic regions to the Isthmus of Panama. The form termed the Spectacled bear, which inhabits the wooded slopes of the Andes and Cordilleras in Chili, is likewise by many naturalists regarded as a mere variety of this species. The American black bear differs only in the non-displayment of certain pale fulvous marks situated on the throat and cheeks, and similar light bands round the eyes from which the Spectacled bear has derived its name. Other varieties of the American black bear have also been described. This species is occasionally as much as five feet in length, but it seldom exceeds that measure. The fur is of a soft even texture, and of a shining black colour. The head is comparatively narrow; the muzzle elongated and pointed. The claws are sharp, strongly curved, and in great part concealed by the hair. Like its congeners, it is partial to well-wooded and rocky grounds. Here it feeds principally upon vegetable matters, but often succeeds in capturing quadrupeds and birds, which it readily devours, as well as fish. When winter approaches, it retires either into the hollow of some tree, or more commonly into a kind of den amongst fallen trees or brushwood, where it digs up the soil in such a way as to scoop out a tolerably secure and snug retreat. A small opening in its snow-clad tenement allows fresh air to enter. The American black bear is naturally timid, nevertheless it is regarded by the natives with considerable dread, chiefly it would appear on superstitious grounds. In proof of this, we produce the following interesting account by Mr. Henry, an early traveller, who was in the neighbourhood of Lake Michigan when the incident which he here describes took place:—"In the course of the month of January, I happened to observe that the trunk of a very large pine tree was much torn by the claws of a bear, made both in going up and down. On further examination, I saw that there was a large opening in the upper part, near which the smaller branches were broken. From these marks, and from the additional circumstance that there were no tracks in the snow, there was reason to believe that a bear lay concealed in the tree. On returning to the lodge, I communicated my discovery, and it was agreed that all the family should go together in the morning to assist in cutting down the tree, the girth of which was was not less than three fathoms. The women at first opposed the undertaking, because our axes, being only of a pound and a half in weight, were not well-adapted to so heavy a labour; but the hope of finding a large bear, and obtaining from its fat a great quantity of oil, an article at the time much wanted, at length prevailed. Accordingly in the morning we surrounded the tree, both men and women, as many at a time as could conveniently work at it; and there we toiled like beavers till the sun went down. This day's work carried us about half-way through the trunk, and the next morning we renewed the attack, continuing it till about two o'clock in the afternoon, when the tree fell to the ground. For a few minutes everything remained quiet, and I feared that all our expectations would be disappointed; but as I advanced to the opening there came out, to the great satisfaction of all our party, a bear of extraordinary size, which I shot. The bear being dead, all my assistants approached, and all, but particularly my old mother (as I was wont to call her), took the head in their hands, stroking and kissing it several times, begging a thousand pardons for taking away her life, calling her their relation and grandmother, and requesting her not to lay the fault upon them, since it was truly an Englishman that had put her to death. This ceremony was not of long duration, and if it was I that killed their grandmother they were not themselves behind-hand in what remained to be done. The skin being taken off, we found the fat in several places six inches deep. This being divided into two parts, loaded two persons; the flesh parts were as much as four persons could carry. In all, the carcass must have exceeded five hundredweight. As soon as we reached the lodge the bear's head was adorned with all the trinkets in the possession of the family, such as silver arm-bands and wrist-bands, and belts of wampum, and then laid upon a scaffold set up for its reception within the lodge. Near the nose was placed a large quantity of tobacco. The next morning no sooner appeared than preparations were made for a feast to the manes. The lodge was cleaned and swept, and the head of the bear lifted up, and a new Stroud blanket which had never been used before laid under it. The pipes were now lit, and Wawatam blew tobacco smoke into the nostrils of the bear, telling me to do the same, and thus appease the anger of the bear on account of my having killed her. I endeavoured to persuade my benefactor and friendly adviser that she no longer had any life, and assured him that I was under no apprehension from her displeasure; but the first proposition obtained no credit, and the second gave but little satisfaction. At length, the feast being ready, Wawatam made a speech resembling in many respects his address to the manes of his relations and departed companions, but having this peculiarity that he here deplored the necessity under which men laboured thus to destroy their friends. He represented, however, that the misfortune was unavoidable, since without doing so they could by no means subsist. The speech ended, we all ate heartily of the bear's flesh; and even the head itself, after remaining three days on the scaffold, was put into the kettle." Independent of these statements, we have plenty of evidence that the flesh of the American black bear is excellent eating; and recently Mr. Oliphant, who has enjoyed considerable experience of different kinds of food both in the eastern and western quarters of the northern hemisphere, declares for himself and his companions that it is a "royal feast" In the winter time the female produces from one to five cubs, and in order to secure her progeny from the attack of other animals, such as wolves and the like, she makes her lodging, as we have seen, high up among the branches of thickly-wooded trees.

THE GRISLY BEAR (*Ursus ferox*) is also an American species. Its disposition is exceedingly fierce, and it is endowed with prodigious strength. Its muscular power may be estimated by the circumstance of a specimen of this animal having been seen to carry the carcass of an American buffalo, weighing about one thousand pounds, to a considerable distance. The travellers Messrs. Lewis and Clark measured a specimen which had attained a length of nine feet, and some persons pretend to have met with individuals several feet longer. The head is broad and flattish on the crown, and nearly even from the occiput to the nose, except in old specimens; the ears are short and conical; the muzzle being wide, and of a pale colour. The fur is long and of a deep-brown tint; commercially speaking, it is of inferior quality. Its limbs are powerful, the feet being armed with very long, compressed, white, strongly-curved claws; the inferior border of the latter is particularly narrow. Its rudimentary tail is entirely concealed by the hair. With regard to its habits, the grisly bear is more carnivorous than the preceding species, although it does not refuse to subsist on a vegetable diet if animal food be not forthcoming. Sir John Richardson has given us the following interesting narrative, which he states to be derived from authentic sources:—"A party of voyagers who had been employed all day in tracking a canoe up the Sasketchewan, had seated themselves in the twilight by a fire, and were busy in preparing their supper, when a large grisly bear sprung over their canoe that was tilted behind them, and seizing one of the party by the shoulder, carried him off. The rest fled in terror, with the exception of a Metif named Bourasso, who, grasping his gun, followed the bear as it was retreating leisurely with its prey. He called to his unfortunate comrade that he was afraid of hitting him if he fired at the bear, but the latter entreated him to fire immediately, without hesitation, as the bear was squeezing him to death. On this he took a deliberate aim, and discharged his piece into the body of the bear, which instantly dropped its prey to pursue Bourasso. He escaped with difficulty, and the bear ultimately retreated to a thicket, where it was supposed to have died; but the curiosity of the party not being a match for their fears, the fact of its decease was not ascertained. The man who was rescued had his arm fractured, and was otherwise severely bitten by the bear, but finally recovered. I have seen Bourasso, and can add that the account which he gives is fully credited by the traders resident in that part of the country, who are best qualified to judge of its truth from the knowledge of the parties. I have been told that there is a man now living in the neighbourhood of Edmonston House who was attacked by a grisly bear, which sprung out of a thicket, and with one stroke of its paw completely scalped him, laying bare the skull, and bringing the skin of the forehead down over the eyes. Assistance coming up, the bear made off without doing him further injury, but, the scalp not being replaced, the poor man has lost his sight, although he thinks that his eyes are uninjured. Mr. Drummond, in his excursions over the Rocky Mountains, had frequent opportunities of observing the manners of grisly bears, and it often happened that in turning the point of a rock or sharp angle of a valley he came suddenly upon one or more of them. On such occasions they reared on their hind legs and made a loud noise like a person breathing quick, but much harsher. He kept his ground without attempting to molest them, and they on their part, after attentively regarding him for some time, generally wheeled round and galloped off; though, from their known disposition, there is little doubt he would have been torn in pieces had he lost his presence of mind and attempted to fly. When he discovered them from a distance, he generally frightened them away by beating on a large tin box in which he carried his specimens of plants. He never saw more than four together, and two of these he supposes to have been cubs; he more often met them singly or in pairs. He was only once attacked, and then by a female, for the purpose of allowing her cubs time to escape. His gun on this occasion missed fire, but he kept her at bay with the stock of it, until some gentlemen of the Hudson's Bay Company, with whom he was travelling at the time, came up and drove her off. In the latter end of June, 1826, he observed a male caressing a female, and soon afterwards they both came towards him, but whether accidentally, or for the purpose of attacking him, he was uncertain. He ascended a tree, and as the female drew near, fired at and mortally wounded her. She uttered a few loud screams, which threw the male into a furious rage, and he reared up against the trunk of the tree in which Mr. Drummond was seated, but never attempted to ascend it. The female, in the meanwhile retiring to a short distance, lay down, and as the male was proceeding to join her, Mr. Drummond shot him also. From the size of their teeth and claws, he judged them to be about forty years old. The cubs of the grisly bear can climb trees, but when the animal is fully grown it is unable to do so, as the Indians report, from the form of its claws. Two instances are related by Lewis and Clarke, and I have heard of several others, where a hunter having sought shelter in a tree from the pursuit of a grisly bear, has been held a close prisoner for many hours, by the infuriated animal keeping watch below." The flesh of the grisly bear is of very inferior quality; so much so, indeed, that the native Indians reject it, unless other food cannot be procured. Although these animals invariably hybernate during the winter months, the old males sometimes steal forth from their snug abodes to seek for food. The grisly bear has a pretty wide geographical distribution on the North American continent, extending from a latitude of upwards of sixty degrees north, to Mexico in the south. It is most abundant on the eastern slopes of the Rocky Mountains.

THE POLAR BEAR (*Thalarctos maritimus*), Plate 12, fig. 39.—This is the most carnivorous of all the bears, probably however, more by necessity than by choice. It is essentially a marine animal, destined to wander to and fro on blocks of ice, in dreary solitudes and wastes, seldom visited, save by the Esquimaux and a few of the more enterprising spirits of human kind. Here the polar bear makes havoc among seals, whales, walruses, and other denizens of the polar seas. Dead or alive, nothing comes amiss, while his skill enables him to secure not only fish, but even birds. The general appearance of the polar bear is too well known to require a lengthened description; yet, it is necessary to notice a few of the principal characters. The body is more cylindrical than that of the land varieties of bear; the head is likewise rather more elongated; the ears are short. The muzzle is somewhat curved, the mouth being comparatively small, while the neck is long and thick The fur, generally speaking, is white, long, loose, woolly in texture, and has a silvery lustre; on the legs and under the surface of the belly the hairs are much more lengthened. The claws are short, only slightly curved, and nearly concealed by the fur. The size attained by the polar bear is very considerable. Captain Lyons met with a specimen measuring rather more than eight and a half feet in length, and weighing sixteen hundred pounds avoirdupois. The same gentleman obtained from an intelligent Esquimaux the following account of the manner in which this animal hybernates:—"At the commencement of winter the pregnant bears are very fat and always solitary. When a heavy fall of snow sets in, the animal seeks some hollow place in which she can lie down, and remains quiet while the snow covers her. Sometimes she will wait until a quantity of snow has fallen, and then digs herself a cave; at all events, it seems necessary that she should be covered by, and lie amongst the snow. She now goes to sleep, and does not wake until the spring sun is pretty high, when she brings forth two cubs. The cave by this time has become much larger, by the effect of the animal's warmth and breath, so that the cubs have room enough to move, and they acquire considerable strength by continually sucking. The dam at length becomes so thin and weak, that it is with great difficulty that she extricates herself, when the sun is powerful enough to throw a strong glare through the snow which roofs the den." We have already alluded to this animal's cunning and activity. Here is the method it adopts to catch a seal, for the account of which we are also indebted to the "Private Journal" of Captain Lyon:—"The bear, on seeing his intended prey, gets quietly into the water, and swims to leeward of him, from whence, by frequent short dives, he silently makes his approaches, and so arranges his distance that, at the last dive, he comes to the spot where the seal is lying. If the poor animal attempts to escape by rolling into the water, he falls into the bear's clutches; if, on the contrary, he lies still, his destroyer makes a powerful spring, kills him on the ice, and devours him at leisure." Captain Sir Edward Belcher, in his interesting work entitled "The Last of the Arctic Voyages," also gives an amusing description of the performances of a female polar bear, whose antics seemed to have for their object the capture of a seal by another shrewd expedient. On the first day of June, 1853, he writes:—"We pushed on for Tongue Point, and there pitched. More bears! I was busy on the Point with the instrument, watching for an object, when I noticed a lady and her cub, amusing themselves, as I imagined, at a game of romps, but the old lady was evidently the more excited. Possibly no such opportunity has before been afforded to any naturalist of witnessing quietly the humours or habits of these animals. At first the motions of the mother appeared to me as ridiculously absurd, or as if she was teaching her cub to perform a summerset, or something nearly approaching it; but the cub evinced no interest, no participation in the sport, indeed moved off and lay down, apparently to sleep. The antics, too, of the mother were too distant from the cub to prove instructive. I will endeavour to convey my impression of the exhibition, as viewed through the telescope at a distance of a quarter of a mile, as well as the object on which she appeared intent. It must first be borne in mind, that a bear of such dimensions as that before me would weigh about six and a half or seven hundredweight. The object apparently in view was to break a hole in the ice. In order to effect this the claws were first put in requisition, and as nimbly and gracefully as a dog did the huge creature tear up and scatter snow and ice to the winds; having removed as she imagined sufficient, she then appeared to estimate her distance, calculate on her leap, and in the effort came down *perpendicularly* on her fore-paws over the spot which she had scratched. Something, she imagined, had been effected. She continued to repeat this scratching and amusing mode of pounding until at length she appeared satisfied, when she assumed an attitude of 'dead point,' with fore-paw raised, and remained for some time immovable. The question occurred to me, 'Is this a mode, by concussion and making a hole, of seducing a seal within gripe?' for I have repeatedly noticed that when we cut for tide-hole, fire-hole, &c., that these inquisitive animals will show themselves. This, however, I leave for others to verify." After this, an unsuccessful attempt was made to get within shot, but both mother and cub made their escape. Sir E. Belcher does not state whether he minutely examined the spot thus signalized, to ascertain if any injury had been done to the ice; nevertheless, his observations have very great interest, and the correctness of his conjecture is placed almost beyond a doubt. The female bear, as we have just seen, is very careful over her cubs; these, if taken while still very young, may be successfully tamed. The following incident, however, shows the necessity of caution:—An English officer, while stationed at one of the more remote and lonely fortresses of Canada, amused himself by taming a young polar bear. He succeeded in teaching the little cub to fetch and carry, and its behaviour was so unexceptionable that the animal was allowed to share his master's meals, and to follow at his heels when out for a walk. On returning to this country, the ursine pet accompanied the officer on board ship, and soon acquired the unreserved confidence of the passengers and crew, and by his facetious antics afforded them much pleasure and diversion. In a very short time, as is frequently the habit with domesticated animals, he showed a particular liking for children of the female sex, and singled one out as an especial favourite; the little girl, who was a daughter of one of the lady passengers, reciprocated the bear's attentions, and the loving pair daily romped about the deck with ecstatic delight. This fun, however, was after a time destined to be suddenly changed into sorrow, for on one occasion during their gambols, the animal, without giving any previous indication of his purpose, suddenly seized the young lady by the waist, and before the astonished crew and half-distracted parent could do aught to arrest his progress he was half way up the rigging; neither did he rest till he had gained the maintop! Doubtless, many of our readers have heard of an elopement *down*, but, perhaps, never *up* a ladder of ropes! But the matter is too serious for a joke! What is to be done? The mother cries!—the child screams!—and the bear recommences its antics! A moment's delay may render all chance of escape hopeless! Alarm and consternation fill every breast! Shall the sailors ascend the rigging, and by united force tear the frail captive from its arms? If the bear should at any moment relinquish its hold, the poor child must be dashed in pieces! Bravo!—a bright idea has struck the captain! See with what alacrity his orders are obeyed! Mattrasses and pillows are placed around the mast, in case the child should fall, while numerous lumps of sugar are piled together on the deck! Hurrah! the saccharine dainty cannot be resisted! Down comes Bruin, carefully bringing the captive with him! Once more, hurrah! Mother and bear are satisfied! The child is released—the sugar devoured! It is almost needless to add, that during the rest of the voyage, the animal was entirely deprived of his sadly-abused liberty. In regard to the capture and destruction of full-grown polar bears in the wild state, early writers have always described such attempts as extremely dangerous; these accounts have probably been exaggerated, but there can be no doubt that in recent times the danger has been materially lessened by the introduction of longer-ranged and more destructive fire-arms. The polar bear seldom quits the regions of eternal ice and snow; nevertheless he is sometimes observed drifting out to sea on floating icebergs; by this means he makes excursions to very considerable distances, and has been observed by Captain Scoresby upwards of two hundred miles from the shore. As many as a dozen have come over from West Greenland and landed on the coast of Iceland during a single winter season. Captain Parry, when passing through Barrow's Strait, encountered a polar bear swimming vigorously in the open sea, although at the time the animal was fully forty miles from any coast, and there were no traces of floating ice in any direction. Specimens of this animal have always constituted an attractive feature in our menageries, and, notwithstanding the unsuitable character of this climate, they seem to live pretty comfortably. A few years since one of the very fine specimens kept in the Zoological Gardens at Edinburgh gave birth to a solitary cub, but it very soon perished.

FAMILY II.—MUSTELIDÆ.

Not only are the weasels, properly so called, placed under this head, but also numerous genera, whose relations are so closely allied to the foregoing family that they are grouped by some naturalists with the Ursidæ, and by others with the present family. On this point we purposely adhere to the Cuvierian arrangement, as far as circumstances permit. The Mustelidæ, as we have retained the genus, are either semi-plantigrade or to a greater or less extent digitigrade—that is to say, they are supported on the tips of their toes during progression. The feet are five-toed or pentadactylous, the claws being fixed or non-retractile. They have elongated, slim, and cylindrical bodies; it is on account of this long vermiform or worm-like character that the majority of them are called vermin, though to the popular mind that term rather expresses the idea of certain noxious qualities, altogether independent of its etymological signification. The limbs of Mustelidæ are short. The head is rounded and narrowed anteriorly, but that part of the skull containing the brain is considerably extended; so that the space between the sockets and the posterior margin of the cranium, is much greater than that which obtains in the higher digitigrade Carnivora. The jaws support the usual complement of twelve incisors and four canines, whilst there are generally four or five molars on either side belonging to the upper series, and five or six similarly disposed in each division of the lower group. Four of these teeth are tuberculated—that is, one to each of the four divisions of the grinding series above indicated. The condyles or articulating extremities of the rami of the lower jaw are broad transversely, and completely lodged in the corresponding socket called the glenoid cavity. The Mustelidæ, like the bears, have no blind or cæcal appendage to the intestine. They do not pass the winter in a state of hybernation. Their destructive and sanguinary propensities are well known; and members of the family are found in all quarters of the globe. Musteline fossil remains occur in the bone-caves and osseous breccias of the tertiary period.

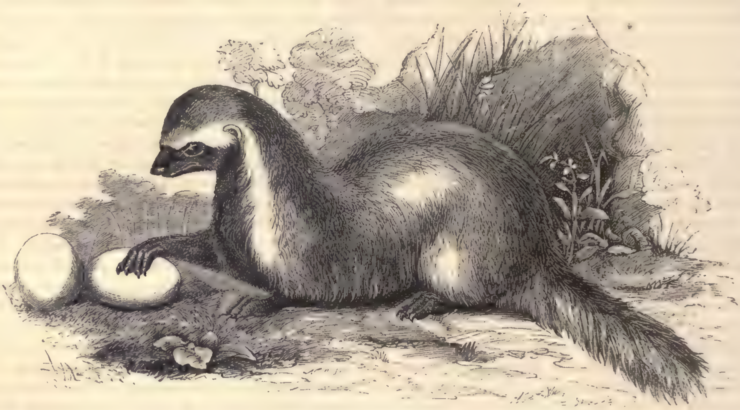
THE JAVANESE TELEDU (*Mydaus meliceps*).—Purposely commencing our weasels with this aberrant type, more particularly on account of its close relations to certain ursine and insectivorous genera, we remark, in the first place, that the muzzle is prolonged in the form of a proboscis. The grinding teeth are eighteen in number, there being twelve spurious and six true ones. The laniary, cutting, or carnassial tooth—that is, the fourth or last premolar tooth, reckoning from before backwards—supports an accessory central cusp. The head is hog-like; the ears being rudimentary, and surrounded by a tuft of long fur. The fur consists of delicate hairs, which are more or less blackish-brown throughout, except on the central line of the back, on the top of the head, and at the end of the tail, which latter is only half an inch in length, not taking into consideration the long hairs projecting beyond the skin. The body measures about fifteen inches. The limbs are short, thick, and semi-plantigrade, the compressed and rather straight claws being united at the base by a sheathing membrane. The teledu emits a most horrible odour, as the author of this article can abundantly confirm, from having had a specimen placed in his hands for dissection and preservation. The intolerable stench arises from the secretion of a peculiar matter by two oval glands situated at the posterior part of the body, and opening into the intestine near the vent. The animal has the power of ejecting this secretion to a distance of about two feet. "The fetid matter itself is of a viscid nature; its effects depend on its great volatility, and they spread through a great extent; the entire neighbourhood of a village is infected by the odour of an irritated teledu, and in the immediate vicinity of the discharge it is so violent as in some persons to produce syncope." Dr. Horsfield gives the following admirable account of its habits and singular geographical distribution:—"The teledu is confined exclusively to those mountains which have an elevation of more than seven thousand feet above the level of the ocean; on these it occurs with the same regularity as many plants. The long-extended surface of Java, abounding with conical points which exceed this elevation, afford many places favourable for its resort. On ascending these mountains, the traveller scarcely fails to meet with our animal, which, from its peculiarities, is universally known to the inhabitants of these elevated tracts; while to those of the plains, it is as strange as an animal from a foreign country. A traveller would inquire in vain for the teledu at Batavia, Semarang, or Surabaya. In my visits to the mountainous districts, I uniformly met with it; and, as far as the information of the natives can be relied on, it is found on all the mountains. . . Most of these mountains and ridges furnish tracts of considerable extent fitted for the cultivation of wheat and other European grains. . . . These grounds and plantations are laid out in the deep vegetable mould, where the teledu holds its range as the most ancient inhabitant of the soil. In its rambles in search of food, this animal frequently enters the plantations, and destroys the roots of young plants; in this manner it causes extensive injury, and on the Tengger Hills particularly, where these plantations are more extensive than in other elevated tracts, its visits are much dreaded by the inhabitants. It burrows in the earth with its nose in the same manner as hogs, and in traversing the hills its nocturnal toils are observed in the morning in small ridges of mould recently turned up. The mydaus forms its dwelling at a slight depth beneath the surface, in the black mould, with considerable ingenuity. Having selected a spot, defended above by the roots of a large tree, it constructs a cell or chamber of a globular form, having a diameter of several feet, the sides of which it makes perfectly smooth and regular; this it provides with a subterraneous conduit or avenue about six feet in length, the external entrance to which it conceals with twigs and dry leaves. During the day it remains concealed, like a badger in its hole; at night it proceeds in search of its food, which consists of insects and their larvæ, and of worms of every kind. It is particularly fond of the lumbrici, or earthworms, which abound in the fertile moulds. These animals, agreeably to the information of the natives, live in pairs, and the female produces two or three young at a birth. The motions of the mydaus are slow, and it is easily taken by the natives, who by no means fear it. During my abode on the mountain Prahu, I engaged them to procure me individuals for preparation; and, as they received a desirable reward, they brought them to me daily in greater numbers than I could employ. Whenever the natives surprise them suddenly, they prepare them for food; the flesh is then scarcely impregnated with the offensive odour, and is described as very delicate. The animals are generally in excellent condition, as their food abounds in the fertile moulds. . . The mydaus is not ferocious in its manners; and taken young, like the badger, it might be easily tamed. An individual which I kept some time in confinement afforded me an opportunity of observing its disposition; it soon became gentle and reconciled to its situation, and did not at any time emit the offensive fluid. I carried it with me from Mountain Prahu to Blederan, a village on the declivity of that mountain where the temperature was more moderate. While a drawing was made, the animal was tied to a small stake; it moved about quietly, burrowing the ground with its snout and feet, as if in search of food, without taking notice of the bystanders, or making violent efforts to disengage itself. On earthworms being brought, it ate voraciously; holding one extremity of a worm with its claws, its teeth were employed in tearing the other. Having consumed about ten or twelve, it became drowsy, and making a small groove in the earth, in which it placed its snout, it composed itself deliberately, and was soon sound asleep."

THE NYENTEK (*Helictis moschatus*) is a rarer animal than the teledu, and more circumscribed in its geographical area of distribution. It is about sixteen inches in length, not including the tail, which measures six inches more; this organ is bushy, terminating in long thick hairs. The head is small, gradually narrowing into an obtusely-pointed muzzle. The jaws are furnished with twenty-two molars, the tuberculated pair above being small and widened transversely. The nostrils are notched at the side. The moustaches are few in number, long, and bristly. The ears are comparatively large; the eyes being rather prominent. The limbs are thin, terminating in five-toed plantigrade feet. The claws are shorter than those of the teledu, and are more strongly curved. This animal, says Dr. Horsfield, who described it as a species of *Gulo*, "is somewhat smaller than the English pole-cat. The form of its body, in comparison with other gluttons, is rather slender; it is thickly covered with fur, consisting of long hairs closely arranged, silky at the base, of a brown colour and somewhat glossy, with a slight tint of reddish-brown; in certain lights it appears diversified, greyish, and tawny. This fur covers the greatest part of the body and head, and the whole of the tail and extremities; the colour of these parts is consequently brown, with occasional shades of rufous and tawny; the sides of the head, the neck, the throat, breast, and a broad spot on the top of the head, which passes, gradually decreasing in breadth, to the middle of the back, are white, with an obscure tint of isabella yellow of different degrees of intensity. This colour also exists, less distinct, in a longitudinal band along the lowest part of the abdomen." Little or nothing is known of this animal's habits, which are thought by Dr. Horsfield to be similar to those of the ratel.

THE SKUNK (*Mephitis americana*), Plate 10, fig. 33.—Various species of skunk have been described, but most of them appear referable to this species. The true skunks are confined to the American continent. Accepting Sir John Richardson's description, the skunk very closely resembles the wolverene. The body is stoutish, and stands low; the eyes being small, and the ears short and rounded. "A narrow white mesial line runs from the tip of the nose to the occiput, where it dilates into a broad white mark. It is again narrowed, and continues so until it passes the shoulders, when it forks, the branches running along the sides, and becoming much broader as they recede from each other. They approach posteriorly and unite on the rump, becoming at the same time narrower. In some few specimens the white stripes do not unite behind, but disappear on the flanks. The black dorsal space included by the stripes is egg-shaped, the narrow end of which is towards the shoulders. The sides of the head and all the under parts are black. The hair on the body is long. The tail is covered with very long hairs, and has generally two broad longitudinal white stripes above on a black ground. Sometimes the black and white colours of the tail are regularly mixed. Its under surface is black. The claws on the fore-feet are very strong and long, being fitted for digging, and very unlike those of the martens." The jaws are provided with eighteen molar teeth, the upper laniary grinder being remarkably large. Respecting the habits of the skunk, which has obtained such notoriety on account of the nauseating smell emitted from the glands previously alluded to, the same distinguished naturalist writes:—"It exists in the rocky and woody parts of the country, but is still more frequent in the clumps of wood which sketch the sandy plains of Seskatchewan. I have not been able to ascertain the southern range of this variety of skunk [from Hudson's Bay]; and, judging from Kahn's description, there appears to be a different one in Canada. The skunk passes its winter in a hole, seldom stirring abroad, and then only for a short distance. It preys on mice, and in summer has been observed to feed much on frogs. It has a slow gait, and can be overtaken without difficulty, for it makes but a poor attempt to escape, putting its trust apparently in its power of discomfiting its pursuers by the discharge of a noisome fluid. This fluid, which is of a deep yellow colour, and is contained in a small bag placed at the root of the tail, emits one of the most powerful stenches in nature, and so durable that the spot where a skunk has been killed will retain the taint for many days. Mr. Graham says that he knew several Indians who lost their eyesight in consequence of inflammation produced by this fluid having been thrown into them by the animal, which has the power of ejecting it to a distance of upwards of four feet. I have known a dead skunk thrown over the stockades of a trading port, which produced instant nausea in several women, in a house with closed doors upwards of a hundred yards distant. The odour had some resemblance to that of garlic, although much more disagreeable. One may, however, soon become familiarized with it; for, notwithstanding the disgust it produces at first, I have managed to skin a couple of recent specimens by recurring to the task at intervals. When care is taken not to soil the carcase with any of the strong smelling fluid, the meat is considered by the natives to be excellent food." These observations agree for the most part with those of Catesby, who says:—"When one of them is attacked by a dog, to appear formidable it so changes its usual form, by bristling up its hairs and contracting its length into a round form, that it makes a very terrible appearance. This menacing behaviour, however insufficient to deter its enemy, is seconded by a repulse far more prevailing; for from some secret duct it emits such fetid effluvia that the atmosphere, for a large space around, shall be so infected with it that men and other animals are impatient till they are quit of it. The stench is insupportable to some dogs, and necessitates them to let their game escape; others, by thrusting their noses into the earth, renew their attacks till they have killed it; but rarely care to have more to do with such noisome game, which for four or five hours distracts them. The Indians, notwithstanding, esteem their flesh a dainty, of which I have eaten and found it well tasted. I have known them brought up young, made domestic, and prove tame and very active, without exercising that faculty which fear and self-preservation perhaps only prompt them to." Like its congeners, the skunk does not entirely confine itself to an animal diet, vegetable matters, especially fruit, being sought in the absence of small quadrupeds, frogs, and insects. The female produces from six to ten young at a birth. In the Catalogue of Mammalia preserved in the British Museum, this species is called by Dr. Gray *Mephitis varians*.

THE GRISON (*Galictis vittata*).—The members of the genus Galictis originally established by Mr. Bell, are characterized by the possession of eighteen molar teeth, of which ten are spurious, four of them belonging to the upper series and six to the lower. The body is much elongated, terminating in sub-plantigrade pentadactylous feet, their palms and soles being naked. The tail is of moderate length. In the species under consideration "the colours are very remarkable, and the markings distinct and decided (fig. 23). The whole of the upper part of the head, the neck, the back, the flank, and the tail, are yellowish-light or brownish-grey, produced by the mixture of a dirty yellowish-white with brownish-black for about two-thirds of their length; the tip, dirty or yellowish-white. The muzzle, the cheeks, the throat, the under part of the neck, the belly, the anterior legs, and the hinder feet, are black, with a brownish tinge lighter towards the back part, and on the belly interspersed with a few whitish hairs. The grey of the upper, and the black of the under parts, are separated by a rather broad fascia (or band), extending on each side from the centre of the forehead above the eye, backwards as far as the shoulder, including the ears; this fascia is of a buff or yellowish-white colour." Respecting its habits, Mr. Bell also records the following interesting particulars. In his "History of British Quadrupeds," he says:—"A tame grison (*Galictis vittata*) which I possessed for several years, was very fond of frogs, but these were not the only reptiles which were obnoxious to its voracity. On one occasion, in the winter, I had placed it in its cage, in a room with a fire, where I had also two young alligators, which in general were stupidly tame. On going into the room in the morning, I found the grison at large, and one of the alligators dead, with a hole eaten under the fore-leg, where the great nerves and bloodvessels were torn through; and the other alligator began snapping furiously at every one who attempted to approach it." The same eminent naturalist elsewhere remarks that this grison "was as tame and affectionate as a dog; and she followed me," he adds, "wherever I went about the house, was extremely frolicsome and playful, and was delighted at being caressed. She would throw herself on her back, and seize the hand that fondled her with all four of her paws and her mouth at the same moment, pressing it with her teeth, but never sufficiently hard to cause the slightest degree of pain. She was extremely fond of eggs, which she ate in a very singular manner. On one being given her, she first played with it for some time, running backwards and at the same time pushing it under her belly with her fore-feet. At length she would fix one of her sharp canine teeth through the shell, and lick or suck as much of the contents as would flow through the orifice. Then, again inserting her tooth, a piece of the shell was broken out so as to enable her to insert her tongue; and, finally, the egg-shell was broken to pieces and each fragment carefully licked clean." The grison is an inhabitant of the northern regions of Brazil, the specimens hitherto seen in this country having been brought from Guiana and Paraguay. A brief, but very accurate description of a fine example captured by Mr. Edmonston at Demerara, is described by Dr. Traill in the third volume of the Wernerian Society's Transactions. It measured nearly three feet in length, including the tail which gave nine inches. In the list of Mustelidæ preserved in the British Museum, this species is denominated *Grissonia vittata*.

Fig. 23.



The Grison (Galictis vittata)

ALLAMAND'S GRISON (*Galictis Allamandi*), appears to be a well-marked form. Mr. Bell has given a beautiful figure of it, accompanied with another of the above, in the second volume of the Transactions of the Zoological Society. According to his description, "this species, though evidently distinct from the former, exhibits the same general character of colour and marking, with some remarkable differences, however, which, though not easily expressed in a specific phrase, are tangible and important. The whole of those parts which in the former species are yellowish, are here perfectly white; and those which are blackish-brown in the former, are in this pure black. The basal portion of the hairs on the back, therefore, is black, and the apical quite white, forming a pure blackish-grey or black, with white points and lines, whilst all the under parts of the throat and part of the belly are black. The fascia extending from the forehead to the sides of the neck is also white. This fascia does not extend in the specimen described so far back as in the former species. The hairs of the whole body are very short in comparison, and much stiffer and more closely set. The animal is considerably larger, and the tail, as far as can be ascertained from a stuffed specimen, short in proportion." As in the foregoing, its habits correspond with those of the weasels generally.

THE ZORILLA (*Zorilla striata*).—Several forms described under the generic title of Zorilla, are probably merely varieties of one and the same species. Perhaps two or three of them may fairly be regarded as distinct Their differentiation obtains chiefly in respect of colour and other superficial characters, which, however, are in too many instances the only distinctions the zoologist can rely on, as he may have none other to guide him. The zorilla, known to the colonists at the Cape of Good Hope by the name of *muishond*, possesses eighteen molar teeth, four being placed on either side above, and five correspondingly opposed on each side below. The prepared skeleton exhibits five vertebral segments in the lumbar region of the spine, while there are no less than fifteen pair of ribs. The fur is of a black colour generally; but there are four whitish bands, which, commencing at the neck, pass in a backward direction, gradually diverging from one another. This character has suggested the specific name above given. There is also a white spot on the upper part of the head. The zorilla is not confined to the Cape of Mozambique, but is still found in Nubia, Abyssinia, and other parts of the African continent. Its habits are similar to those of the skunk. It is also known under the title of *Mephitis africana.*

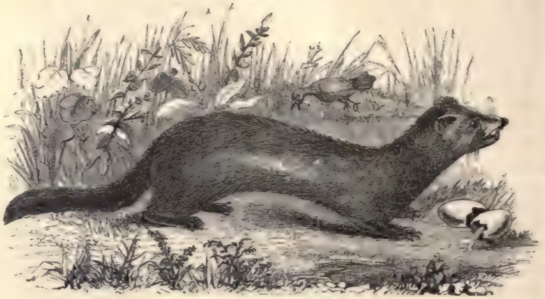
THE SABLE (*Martes leucopus.*)—The various members of the genus Martes, differ from the true weasels generally, by the possession of "an additional false molar above and below," whilst they have also a small tubercle on the inner side of their sectorial tooth. These two characters tend to diminish the ferocity of their nature; or, rather, they indicate by analogical and correlative evidence, that such a subcarnivorous disposition exists in accordance with their modified dental arrangements. Their habits and general appearance entirely correspond with these structural peculiarities. They are pretty and attractive little animals, having large bushy tails. The martens have larger ears than the weasels, and their habits are more arboreal, while the odour emitted by them is not offensive. Much controversy has arisen as to the specific distinctions of various kinds of marten. Thus, by some the sable, the pine marten, and the beech marten have been considered as mere varieties of a single species; that is to say, they are supposed to have originated from the same stock, and that stock, in all probability, being represented by a single pair. This view, however, does not appear tenable, and after lengthened investigation, the more general opinion now received is, that they are different animals *ab origine.* The sable is celebrated for its beautiful fur, which is of a yellowish-brown colour, inclining to black. The throat is pale yellow; but it varies somewhat in different individuals. We have here placed the sable as a distinct species, in accordance with the opinion of some of our highest authorities.

THE PINE MARTEN (*Martes abietum*)—Plate 10, fig. 34—if not specifically identical, very closely resembles the foregoing. The fur is of a comparatively inferior quality; yet it is much superior to that of the beech or stone marten. It exists in northern Europe and North America, being also indigenous in our own country. According to Sir John Richardson's description, "the pine marten inhabits the woody districts in the northern parts of America, from the Atlantic to the Pacific, in great numbers, and has been observed to be particularly abundant where the trees have been killed by fire, but are still standing. It is very rare, as Hearne has remarked, in the district lying north of Churchill River and east of Great Slave Lake, known by the name of Chepewyan or Barren Lands. A similar district on the Asiatic side of Behring's Straits, twenty-five degrees of longitude in breadth, and inhabited by the Tchutski, is described by Pennant as equally unfrequented by the marten, and for the same reason—the want of trees. The limit of its northern range in America is, like that of the woods, about the sixty-eighth degree of latitude, and it is said to be found as far south as New England. Particular races of martens, distinguished by the fineness and dark colour of their fur, appear to inhabit certain rocky districts. The rocky and mountainous, but woody districts of the Nipigon, on the north side of Lake Superior, has long been noted for its black and valuable marten skins. The marten preys on mice, hares, and partridges, and in summer on small birds' eggs, &c. A partridge's head with the feathers, is the best bait for the log traps in which this animal is taken. It does not reject carrion, and often destroys the hoards of meat and fish laid up by the natives, when they have accidentally left a crevice by which it can enter. The marten, when its retreat is cut off, shows its teeth, sets up its hair, arches its back, and makes a hissing noise, like a cat. It will seize a dog by the nose, and bite so hard, that unless the latter is accustomed to the combat, it suffers the little animal to escape. It may be easily tamed, and it soon acquires an attachment to its master; but it never becomes docile. Its flesh is occasionally eaten, though it is not prized by the Indians. The females are smaller than the males. They burrow in the ground, carry their young about six weeks, and bring forth from four to seven in a litter about the latter end of April." The dark-coloured furs are deemed the most valuable, and they are in the best condition during the winter season. Respecting the distinctions observable between this species and the beech marten, Mr. Bell observes, that "the most striking and obvious differences are those of colour; but as these appear, in some cases at least, to be associated with certain slight diversities in size and proportion, and as the habits of the two animals also offer a trifling variation, there appears to be some, though far from satisfactory ground, for considering them as specifically distinct. The pine marten is so called from its supposed preference for the fruits of those trees, as the other is called by some the beech marten, from a similar pretended preference for beech woods. There is, however, no ground for this appropriation of the two species to these different localities." The nest is made of moss, leaves, and other vegetable matters. A full-grown individual of the male sex measures about twenty inches, the females being rather smaller.

THE BEECH MARTEN (*Martes foina*), is also called the common marten, and by traders it is more usually designated the stone marten. Its fur is inferior to that of the preceding species, and it is sometimes passed off unfairly for the skin of the true sable. An experienced eye, however, readily detects the fraud, noticing the absence of lustre, softness, and other essential qualities. The beech marten is about eighteen inches long, not including the tail, which alone measures upwards of nine inches. The head is rounded and broad posteriorly, narrowing in front into an acute and slightly projecting muzzle. The ears are comparatively large, oval, and a little pointed. The body is thin, cylindrical, and very mobile, terminating in a thick bushy tail. The fur is for the most part brown, being darker in some parts than in others. It is deeper-coloured on the back, limbs, and tail. On the throat or under part of the neck it is white. The beech marten is a native of the British isles, as well as of Europe generally. It occurs abundantly in rocky mountainous districts, and is perhaps less strictly arboreal in its habits than the pine marten. According to Mr. Bell, "the female makes her nest generally in a hollow tree, but not unfrequently in holes in rocks, sometimes in ruined buildings, or even in granaries and barns. It is formed of straw or grass. She has at least two litters in a year—some assert, four—and the number of young ones at each birth varies from two to seven, the usual number being four or five. The aspect and attitudes of the marten are perhaps more elegant than those of any other of our native quadrupeds. Endowed with great liveliness and activity, its movements are at once rapid and gracile. Its limbs are elastic, and its body lithe and flexible, and it bounds and springs over the ground with equal speed and grace. It is, however, wild and untameable to a great degree, if captured when full grown or after a very early age." The food of the beech marten, in common with its allied forms, consists of birds, squirrels, and other small quadrupeds.

THE PEKAN (*Martes Canadiensis*) of the Canadians, is known by the title of the Fisher or fishing marten, and it has likewise several other names. It presents a more canine look about the face than the sable or other martens. The head is rounded posteriorly, contracting suddenly in front to terminate in a rather sharply-pointed muzzle. The ears are comparatively small. It is a stouter-built animal than the pine marten. The fore-limbs are remarkably strong and short, the claws of the feet being sharp and much curved. As in the pine marten, the soles of the feet are completely enveloped in closely-set hairs, the several digits being connected together at their common base by a short, web-like expansion of the skin. The fur is rather coarse, and of a dark-brown colour, lighter at the fore part of the body, but almost black behind, as well as on the throat, belly, and limbs. White spots are occasionally seen between the fore and hind legs. The fur has a strong musky odour, and its quality is inferior to that of the sable. Although less sought after by the American fur-dealers, several thousand pekans are destroyed annually for the sake of their skins. Sir John Richardson states that it feeds principally on mice. He adds—"It lives in the woods, preferring damp places in the vicinity of water, in which respect it differs from the marten, which is generally found in the driest spots of the pine forests. The fisher is said to prey much on frogs in the summer season; but I have been informed that its favourite food is the Canada porcupine, which it kills by biting on the belly. It does not seek its food in the water, although, like the pine marten, it will feed on the hoards of frozen fish laid up by the residents." The pekan is widely distributed over the upper half of the North American continent. The female produces from two to four young at a single litter.

Fig. 24.



The Polecat (Mustela putorius).

THE POLECAT (*Mustela putorius*) or *foumart* is a most ferocious creature (fig. 24). "Its appetite for slaughter, which seems never to be satiated as long as any living thing remains within its reach, rendering it a most ruinous neighbour to those who rear fowls or keep up a head of game. Not only the young birds fall victims to it, but the parents also; nor are even geese or turkeys safe. We remember an instance of a hen and a whole brood of chickens being killed by one of these destroyers in a single night; and upon another occasion, seven or eight nearly full-grown turkeys. The brain and the blood seem to be its choicest portions. The bodies of the dead are carried off to its haunts, which are generally in some copse or wood near a farm or in the heart of a preserve, whence it issues on its deadly errand in the evening, generally soon after sunset, or when it grows dusk. No vermin is placed with more satisfaction upon the keeper's tree; for none commits more havoc, if so much, among the game. Beginning with the egg, it persecutes all the game birds through every period of life, and is a far more determined enemy than the stoat itself to the hare and rabbit warren. The fox, as is well known, will do much to keep down the pheasants, and especially the rabbits and hares; but even this wily and powerful invader is not so mischievous as the species of which we are treating. Where a fox will kill one, a polecat will immolate ten, to say nothing of eggs. No vertebrated animal seems to come amiss to its murderous nature. Bewick relates that during a severe storm, a foumart was traced in the snow from the side of a rivulet to its hole at some distance from it. As it was observed to have made frequent trips, and as other marks were to be seen in the snow which could not easily be accounted for, it was thought a matter worthy of great attention. Its hole was accordingly examined, and five fine eels were discovered to be the fruit of its nocturnal excursions. The marks in the snow were made by the motion of the eels in the quadruped's mouth. In *Loudon's Magazine* is an account of a polecat that was hunted to her nest, which held five young ones in a comfortable bed of withered grass. From a side hole the narrator picked out forty large frogs and two toads alive, but capable of sprawling only; for the old polecat had stricken them all with palsy by a bite through the brain of each." Such is Mr. Ogilby's account of its depredations; and there are few of us who have resided in the country that cannot testify to its accuracy. The polecat is a larger and stouter-built animal than the marten. Its body rather exceeds two feet in length, not including the tail, which measures only six inches. The head and neck are comparatively stout and thick. The fur is of a dark-brown colour, approaching black. There is, however, a considerable difference of shade, depending upon the greater or less abundance of short woolly hairs, having a pale brown colour. The lips and cheeks are more or less whitish. The odour given out by the polecat has a very disagreeable smell. It is produced by a fatty substance secreted by a gland situated beneath the tail. The fur, though of comparatively small value, is sold under the name of fitch; hence the term fitchet weasel, another name by which this animal is known. The female produces towards the close of the spring, or in early summer, a litter of five or six young. The nest is made either in a rabbit burrow or in some similar snug retreat, among stones and rocks covered over with long grass, tangled herbage, or low brushwood.

The common ferret is considered by most naturalists to be a mere domesticated variety of the polecat. It exhibits every shade of hue from that of a pale yellowish-white up to a dark fulvous brown, and it is most frequently somewhat variegated. Its habits are similar to those of the wild animal, and they will freely breed together. The ferret, however, can hardly be considered a tame creature, in the strict meaning of the term; for, as most of us have observed, its disposition is exceedingly capricious, and in handling ferrets, as every rat-catcher knows, a certain degree of boldness and caution are necessary. The following sad story, taken from Mr. Jesse's "Gleanings in Natural History," illustrates its truly carnivorous and sanguivorous propensities. "Some few years ago, a poor woman, holding a mangled infant in her arms, rushed screaming with agony and fright into my friend's house, who is a surgeon, imploring him to save the child's life, who, she said, had been almost killed by a ferret. The face, neck, and arms were dreadfully lacerated, the jugular vein had been opened, as also the temporal artery. The eyes were greatly injured, and indeed the child, who is still living, has lost the entire sight of one of them, and has very imperfect vision in the other. Having stopped the still bleeding vessels, my friend accompanied the mother to her cottage, on entering which the child, in some degree recovering from its state of apparent death, began to cry, when the ferret was in an instant seen rushing from behind some basins where he had taken shelter, and with his head erect, boldly came forward and met the infuriated parent in the middle of the room, still holding the infant in her arms. On my friend's kicking the ferret, as the first impulse of protection, the animal endeavoured to seize his leg, and not until his (the ferret's) back was broken by repeated kicks, did he give over his earnest and reiterated attempts to renew his sanguinary feast; and indeed, whilst in the agonies of death, the piteous screams of the child seemed to rouse him to vain efforts to regain his prey. The ferret was of large growth and much distended with the infant's blood; and though formerly of peculiar shyness, yet he lost sight of fear and became bold in the pursuit of the unfortunate infant. It appears the poor woman had left her child (about six months old) in a cradle, whilst she went to market, when it is supposed the infant's cry had arrested the attention of the ferret, who managed to make his escape, and thus effected his purpose. There is good reason to believe he must have passed more than half an hour in the indulgence of his appetite, from the circumstance of the neighbours having heard the piercing shrieks of the child a long time without the slightest suspicion of the mother's absence." Finally, we have only to remark, that the method of employing ferrets for the capture of rabbits, rats, and other vermin is too well known to require more than a passing allusion. In the majority of cases it is advisable to use a muzzle; otherwise the ferret is very apt, after having feasted on its prey, to lay up in the burrow, and disappoint the sportsman. This remark applies more particularly in the case of rabbit hunting.

THE ERMINE OR STOAT (*Mustela erminea*) is a much smaller species. The body is scarcely ten inches long, exclusive of the tail; this organ is four and a half inches in length, slightly bushy towards the tip, the hairs of which are invariably black. In the summer the fur is rufous-brown on the back, and white underneath from the chin to the root of the tail. In the winter the entire fur becomes white, with the exception of the tail; and this change is brought about, not by an alteration of the colour of the summer hairs, as some have supposed, but by the development of new and white hairs in the autumn to supply the place of the falling coloured ones. It is this metamorphosis of the fur which renders the ermine so valuable in commerce. From the North of Europe and Siberia several hundred thousand skins are exported annually to various parts of the world—a large proportion of them being transmitted to this country. Every one is familiar with the pure, white, glossy texture of ermine tippets, boas, and other robes, whose pure snow-white ground-work is beset and adorned with a regularly-disposed series of quincunxially-arranged tails, forming a striking contrast by their rich jet black colour. Such are the leading characteristics of the fur. With regard to this animal's habits, Mr. Bell observes that they vary "from those of the weasel, principally with relation to the difference of size. Although much more destructive than that animal to poultry and to game, the favourite object of its pursuit is the common rat and the water-vole, as that of the weasel is the different species of mice. Prevented from following the latter little pests into their runs, which are often not much larger than their own bodies, the stoat leaves such small game to its little congener, and betakes itself to prey more suited to its own bulk. It occasionally attacks hares even half or two-thirds grown, pursuing them with the utmost pertinacity, and hunting them down by dint of its indefatigable perseverance. The Rev. F. W. Hope informs me, that on one occasion, when shooting in Shropshire, he heard at a short distance the shrill loud scream of a hare, which he concluded was just caught in a poacher's springe. On running towards the spot from whence the sound proceded, he saw a hare limping off greatly distressed, with something attached to the side of the throat, which a nearer approach showed to be a stoat. The hare made its way into the brushwood with its enemy still clinging on. It is a curious fact, that the hare, when pursued by the stoat, does not betake itself to its natural means of escape—its fleetness of foot—which would in a few seconds carry it out of all danger from its little enemy, and which it always employs when escaping from the chase of dogs or of the fox. On the contrary, it hops languidly along, evidently aware of the stoat's approach, yet as if incapable of exerting its powers to avoid the impending destruction. Whether this arises from a stupid indifference, or from not appreciating its danger, or, on the other hand, from intense terror, producing an effect similar to that miscalled fascination, which the small bright eye of the rattlesnake excites in its helpless victims, it is perhaps difficult to decide. The stoat is certainly one of the boldest animals of its size. It pursues its prey with the greatest intrepidity even into circumstances of considerable danger, and, like the weasel, will follow it into the water. It will also cross the water for the purpose of besieging the haunts of the water-vole, *Arvicola amphibius*, of which it destroys great numbers. In swimming it lifts the head and neck well out of the water, like a dog. It hunts its prey by scent." The ermine is comparatively scarcer than the weasel in England; but in Scotland, as Mr. Macgillivray remarks, "it is certainly of more frequent occurrence than that species; and for one weasel, I have seen at least five or six ermines. It frequents stony places and thickets, among which it finds a secure retreat, as its agility enables it to outstrip even a dog in a short race, and the slimness of its body allows it to enter a very small aperture. Patches of furze in particular afford it perfect security, and it sometimes takes possession of a rabbit's burrow. With regard to this little animal's boldness and ferocity of disposition, we have not only the testimony of the gentlemen above named, but that of many others, including Sir John Richardson and Captain Lyon. The author of the section of this work at present under consideration, can also testify to its combativeness, having once been imprudent enough to attempt the capture of a specimen without any weapon. The little beast immediately fastened itself on his armsleeve, but was fortunately dislodged by a violent jerk before its teeth had done more than graze the skin. On falling to the ground it scampered off to the nearest hedgebank, and was soon out of sight. The ermine is usually caught by very simple means, namely, by a trap in the form of a heavy stone or slab, which, being delicately supported by a thin stick baited with flesh, at the first or second nibble suddenly falls and crushes the intruder. Sentimental individuals may be disposed to pity the poor little ermines, who are thus mercilessly destroyed to serve for the external adornment of the wealthy; but we beg to remind such persons that it were better, without warning, to perish like a stoat beneath the squash of a brickbat, than to sit round a well-served table with a Damoclesian sword suspended over one's head. In respect of geographical distribution, the ermine is not confined to the eastern hemisphere; for it is also found abundant in North America. It is, however, not much sought after by the furriers of the Hudson's Bay Company, on account of the large supply imported into Britain from Russia and the north of Europe, which renders it too cheap for a profitable competition. In England the female is said to produce only four or five young at a single birth; but, according to the Canadian aborigines, it produces in America ten or twelve at a litter. The nest is made of grass, leaves, and other vegetable matters, and is placed in a rat-hole or other forsaken burrow.

THE WEASEL (*Mustela vulgaris*).—Having dwelt at considerable length on the character and habits of the stoat, which is so closely related to the present species, our observations respecting the weasel will be necessarily more restricted. It is a smaller animal, the body being about eight and a quarter inches in length, not including the tail, which would give us at least another two inches. The fur is of a reddish-brown colour on the back, head, and tail; but underneath the belly and throat it is quite white. The limbs are short and hairy up to the extremities of the digits. As we have before remarked, its habits are very similar to those of the stoat; but, although generally regarded as a highly noxious animal under some circumstances, would appear to be extremely useful. Mr. Bell, with his usual tact in defending the persecuted of animal kind, thus advocates its cause:—"It is not meant to be asserted that the weasel will not, when driven by hunger, boldly attack the stock of the poultry-yard, or occasionally make free with a young rabbit or a sleeping partridge; but that its usual prey is of a much more ignoble character, is proved by daily observation. Mice of every description, the field and the water-vole, rats, moles, and small birds, are its ordinary food; and from the report of unprejudiced observers, it would appear that this pretty animal ought rather to be fostered as a destroyer of vermin, than extirpated as a noxious depredator. Above all, it should not be molested in barns, ricks, or granaries, in which situations it is of great service in destroying the colonies of mice which infest them. Those only who have witnessed the multitudinous numbers in which these little pests are found, in wheat ricks especially, and have seen the manner in which the interior is sometimes drilled, as it were, in every direction by their runs, can at all appreciate the amount of their depredations; and surely the occasional abduction of a chicken or a duckling, supposing it to be even much more frequently chargeable against the weasel than it really is, would be but a trifling set-off against the benefit produced by the destruction of those swarms of little thieves." Like other creatures preying upon animals, the weasel itself falls a prey to enemies of superior strength; and instances have also been recorded where its sharp bite has enabled it to destroy its more powerful persecutor. The flexibility of the body in such cases is shown to be of essential service. Mr. Bell gives the following story:—"As a gentleman of the name of Pinder, then residing at Bloxworth in Dorsetshire, was riding over his grounds, he saw at a short distance from him a kite pounce on some object on the ground, and rise with it in his talons. In a few moments, however, the kite began to show signs of great uneasiness, rising rapidly in the air, or as quickly falling, and wheeling irregularly round, whilst it was evidently endeavouring to force some obnoxious thing from it with its feet. After a short but sharp contest, the kite fell suddenly to the earth, not far from where Mr. Pinder was intently watching the manœuvre. He instantly rode up to the spot, when a weasel ran away from the kite apparently unhurt, leaving the bird dead, with a hole eaten through the skin under the wing, and the large bloodvessels of the part torn through." Respecting the geographical distribution of the weasel, it has a range almost coextensive with that of the ermine. Even in this country the fur of the weasel has been observed to grow whitish on the approach of winter, while in the higher American latitudes it usually becomes as white as the ermine after the cold season has fairly set in. In these cases the tail retains its normal light reddish-brown colour. In the spring the female produces either four or five young ones at a single birth.

THE VISON (*Vison lutreola*).—This species has been described under a variety of names, such as the vison-weasel, the mink, the minx-otter, and the jackash. It is a very common animal throughout Canada and the United States, as far south as Carolina. The body is nearly a foot and a half in length, exclusive of the tail, which would add seven or eight inches more. The head is small, terminating anteriorly in a short, flat, and abrupt muzzle. The ears are small and oval, the eyes being placed well forward. The cheeks are furnished with very strong, short, brown-coloured whiskers. The jaws are provided with thirty-four teeth, of which there are eighteen molars, four on either side above, and five correspondingly opposed below. The limbs are short, the toes being connected together by a membrane and entirely covered with hair; the claws are almost straight, and project very slightly. The fur is of a rich chocolate brown colour, paler on the head and underneath the body, but approaching to black on the back towards the tail. Near the root of this latter organ there are to be found the usual pair of anal glands, which give out a highly fetid secretion. Respecting its habits, Sir John Richardson remarks that "the vison passes much of its time in the water, and when pursued seeks shelter in that element in preference to endeavouring to escape to land, on which it travels slowly. It swims and dives well, and can remain a considerable time under water. Its short fur forming a smooth glossy coat, its tail exactly like that of an otter, and the shortness of its legs, denote its aquatic habits. It preys upon small fish, fish-spawn, fresh-water mussels, &c., in the summer; but in the winter, when its watery haunts are frozen over, it will hunt mice on land, or travel to a considerable distance through the snow in search of a rapid or fall, where there is still some open water." The same authority further observes that the vison "is not very timid when in the water, and will approach near to a canoe out of curiosity, diving, however, instantly on perceiving the flash of a gun, or any movement from whence it apprehends danger. It is easily tamed, and is capable of strong attachment. In a domestic state it is observed to sleep much in the day, and to be fond of warmth. One which I saw in the possession of a Canadian woman, passed the day in her pocket, looking out occasionally when its attention was roused by any unusual noise. Like a cat, a tame vison is easily offended, and will, on a sudden provocation, bite those who are most kind to it." The female produces from four to seven young at a birth. The fur is not much valued by traders, nevertheless it appears to be of good quality, being soft, fine, and downy; the principal defect is, that it is very short.

THE OTTER (*Lutra vulgaris*), Plate 10, fig. 35.—The genus of which this well-known animal forms a type is partly characterized by the possession of thirty-six teeth, and of these there are twenty molars, the sectorial or laniary grinder of the upper series being enormously developed, while the corresponding carnassials of the lower jaw are tuberculated at the posterior half; there are, in all, six true molars—one on either side of the upper jaw, and two to each divisional series below. In all the members of the genus the body is much lengthened, and in the species under consideration it is upwards of two feet long, exclusive of the tail, which would add nearly a foot and a half more. A full-sized otter will weigh about twenty-four pounds, but the naturalist Pennant has recorded one captured in the river Lea which weighed as much as forty pounds. The head of the common otter is broad and compact, and it terminates anteriorly in an abrupt wide muzzle, the upper lip being particularly thick and overlapping the lower. The ears are small, short, rounded, and widely separated; the eyes are remarkably prominent and placed far forward, about an inch from the tip of the nose. The limbs are short, and end in palmated pentadactylous feet, the several digits being connected together by a strong thick membrane, and they are also armed at the tip with short, non-retractile, but slightly elevated claws. The tail is flattened from above downwards, being immensely strong and broad at the root, in which latter situation, below, there occur the two usual anal glands similar to those described in other musteline genera. The fur is made up of two qualities of hair; the one kind is soft, fine, short, compact, of a whitish colour, save at the tips, where it is brown; the other is long, course, stiff, smooth, and somewhat darker externally at the point. This combination, therefore, is such that, while offering little or no resistance to the water during the forward progress of the animal, it, at the same time, preserves the body from sudden changes of temperature. In every part of the animal the muscular system is very highly developed, and to those who, like ourselves, affect to see much that is attractive even in the so-called dry details of myological anatomy, we could not point out a more beautiful display of muscles than such as may be witnessed by a careful dissection of the neck of the common otter. In point of fact, this creature is exquisitely organized both for rapidity of motion through the lambent waters of a rolling stream, and for overtaking and seizing the swiftest of its finny prey. The spindle-shaped body, elastic to a high degree, and bounded by harmonious curves—the projecting eye-balls—the smooth, close, glossy fur—the broad rudder-forming tail—and the short, web-footed, fin-like limbs,—all combine to show its singular adaptiveness to the fluviatile and lacustrine haunts, where in ceaseless activity it despoils the waters of their abounding piscine treasures! Noiselessly it glides through the liquid medium, rivalling, surpassing, and overcoming the finny tribes; and one by one the latter fall victims to his trenchant grasp! In succession each captive is hurried to the bank, forthwith torn asunder, and the head severed in a moment's time! All this is common testimony which none will dispute. The common otter is, indeed, extremely voracious, and will destroy an incredible quantity of fish; for, when the latter are abundant, he has no sooner detached and devoured the head, and it may be a small additional portion of the body, than off he starts again, as if for the mere pleasure of the chase. Speaking of this animal's habits, Mr. Bell also observes that "the otter avails itself of any convenient excavation, particularly of the hollows beneath the overhanging roots of trees which grow on the banks of rivers, or any other secure and concealed hole near its fishing haunt; though in some cases it fixes its retreat at some distance from the water, and, when driven by a scanty supply of fish, it has been known to resort far inland to the neighbourhood of the farmyard, and attack lambs, sucking-pigs, and poultry—thus assuming for a time the habits of its more terrestrial congeners. It is asserted by some that the otter confines its haunts to the rivers and lakes, never descending to the sea. This, however, is a mistake. In the northern parts of Scotland they certainly frequent the sea, and extend their rambles to a considerable distance from the shore; and Mr. Couch of Polperro, states that "in the summer, and when the weather will permit, it occupies a retired and quiet station where the land stretches into the ocean. It swims low in the water, and will go a mile or more after its prey. The neighbourhood of a populous harbour is a frequent station. Fishes," continues Mr. Couch, "seem to have an instinctive dread of the otter; for I am credibly informed that it has been seen to collect into a shoal a vast number of trouts in a river, and to drive them before until the greater part have thrown themselves on shore." The otter has likewise its enemies. In former times the sport of otter hunting was much sought after in this country, as indeed it probably would also be at the present day, if those animals were only more abundant. In certain parts of Scotland, Wales, and Ireland, otters are still tolerably numerous; but if they were allowed to increase without any check, the more delicate sport of the fly-fisher would be seriously compromised. One of the most interesting facts connected with this persecuted animal is, that with care it may, when taken young, be completely domesticated, and not only become an agreeable companion, but even lend a hand to its master, should he be a fisherman in the ordinary sense of the term. In Sweden, the employment of this animal in the capture of fish appears to be no uncommon circumstance; and an instance has been recorded of an otter which captured eight or ten salmon in a single day. According to Mr. Bell, the following is a method of training recommended:—"They should be procured as young as possible, and they are at first fed with small fish and water. Then bread and milk is to be alternated with the fish, and the proportion of the former gradually increased till they are led to live entirely on bread and milk. They are then taught to fetch and carry, exactly as dogs are trained to the same trick; and when they are brought to do this with ease and docility, a leather fish stuffed with wool is employed for the purpose. They are afterwards exercised with a dead fish, and chastised if they disobey or attempt to tear it; and finally, they are sent into the water after living ones. In this way, although the process is somewhat tedious, it is believed that the otter may be certainly domesticated, and rendered subservient to our use." Independent, moreover, of their value as purveyors of fish, several accounts go to prove that, in the tame state, they become tractable, docile, and even amusing creatures. In the early spring of the year the female produces from three to five young at a birth. The flesh has a coarse fishy flavour, and is not considered good eating.

THE AMERICAN OTTER (*Lutra americana*) is a much larger species than the above. The body is three feet and a half in length, exclusive of the tail, for which we must reckon other eighteen inches. The fur is of a rich brown colour, not only on the back, but also underneath the belly; differing in this latter particular from the European species, which is lighter below. According to Hearne, the fur is nearly black in the summer, but in the winter it assumes the characteristic chocolate brown, a greyish spot being placed under the chin. This form of otter is widely distributed throughout the North American continent. Sir John Richardson states that it closely resembles the common otter in its habits and food. "In the winter season it frequents rapids and falls, to have the advantage of open water; and when its usual haunts are frozen over, it will travel to a great distance through the snow in search of a rapid that has resisted the severity of the weather. If seen and pursued by hunters on these journeys, it will throw itself forward on its belly, and slide through the snow for several yards, leaving a deep furrow behind it. This movement is repeated with so much rapidity, that even a swift runner on snow shoes has much trouble in overtaking it. It also doubles on its track with much cunning, and dives under the snow to elude its pursuers. When closely pressed, it will turn and defend itself with great obstinacy. In the spring of 1826, at Great Bear Lake, the otters frequently robbed our nets, which were set under the ice, at a distance of a few yards from a piece of open water. They generally carried off the heads of the fish, and left the bodies sticking in the net." This last-named habit strikingly accords with what we have above remarked in regard to the common species, and it explains the extraordinary amount of destruction which these animals are known to create among fishes. The female American otter produces from one to three young at a single birth. The fur is of an excellent texture and quality, but its value is deteriorated by the circumstance of its being rather short; nevertheless, several thousand skins are annually imported into this country. In the list of Mustelidæ contained in the

British Museum, this species is denominated *Lataxina mollis.*

THE BRAZILIAN OTTER (*Lutra Braziliensis*) is, in point of mere size, very similar to the foregoing; the female examples, however, procured by the naturalist D'Azara, did not exceed four feet in length, including the tail, which measured twelve inches in the largest specimen. The fur has a fulvous yellow colour, generally, approaching to a chestnut hue on the limbs and tail. According to D'Azara, as quoted by Mr. Ogilby, this "species lives in troops, which sometimes, rising to the surface of the water, lift their heads and bark like dogs, with a hoarse voice in a menacing and snapping manner, without, however, injuring voyagers or swimmers. Each family seems to possess a separate domain. It spends nearly as much time upon the water as it does upon the land, where it devours the fish which it has taken, and rears its young in holes which it excavates in the banks. The same author was informed by the Payaguas Indians, who sail continually up and down the river, and are better acquainted with this animal than others, that the female brings forth two at a birth, covered with hair, and that many females bring forth and rear their young at the same time and in the same place—their usual resort throughout the year. The motions of this otter are generally slow, and it drags, as it were, its belly and muzzle along the ground; when it runs, it is not at all swift." By the Portuguese colonists of South America, the Brazilian otter is called Loto de Rio, or River-wolf. In the British Museum Catalogue, it is termed the 'Lutra.'

THE JAVANESE OTTER (*Aomyx Leptonyx*) is also known by the names of the simung and the wergul. It is a small species comparatively, the body measuring very little more than two feet, exclusive of the tail, which is about half that length. The character and texture of the fur is very similar to that of our common European species, but the brown colour has a much less rich tint, approaching more to a tawny aspect; the lower part of the face, throat, neck, and breast, being of a light dusky yellow. The whiskers are strongly developed in a double series on either side, one set of bristly hairs arising immediately below the nose, and the other from the posterior region of the cheek. Dr. Horsfield states that "the Javanese otter agrees in its manners with the common otter. It inhabits the banks of rivers, and lives on fishes. Its disposition, when found at large, is extremely ferocious; if attacked, it defends itself with courage. It is with great difficulty taken in its adult state; but, if obtained when young, it is mild and tractable. In this state it is occasionally seen in dwellings, but I never observed it to continue long in confinement. The natives distinguish two varieties of the Javanese otter, to one of which the name of wergul, to the other that of welingsang, is applied. The former is of a grey colour, and is said to be solitary, while the latter lives gregariously; but these statements require confirmation." The species under consideration is found in parts of the Indian Peninsula, Sumatra, Java, their adjacent isles, and the Continent of Siam. Its voice is said to bear some resemblance to that of a person crying. The female exhibits much solicitude and affection for her offspring.

THE SEA OTTER (*Enhydra marina*), or kalan of the Kamtschatkadales, is a very remarkable animal, approximating closely to the pinnigrade seals in its habits and haunts. The length of the body is rather more than three feet, exclusive of the tail, which gives an additional seven or eight inches in a full-grown specimen. The head is rounded posteriorly, the outline, in a profile view, seen passing insensibly, as it were, into that of the strong, thick, muscular neck. The ears are remarkably small, and placed on a much lower level than the eyes. The whiskers are strongly developed. The limbs are short, more especially the anterior pair, and the hinder feet are comparatively more bulky than the fore ones, being also situated very far back. The toes are covered with hair, almost concealing the claws, and the outermost digit of the posterior feet is longer than any of the others. The fur varies in colour at different seasons of the year, and likewise according to the animal's age. Ordinarily, it is of a deep, sooty brown, or sometimes of a rich jet-black colour; but in young specimens it is lighter. There are two kinds of hair as usual; the longer are whitish, and overlap the more numerous soft, downy hairs, which lie partly concealed beneath. The fur has a beautiful, glossy, velvety texture; and, according to Captain Cook's account, is softer and finer than that of any other species. In early times, the skins appear to have fetched an extraordinary price; for Pallas states that single skins were sold at Kiachta, by the Russian furriers, at the rate of one hundred roubles—a sum of money equivalent to twenty pounds sterling. Even now, the sea otter's fur is highly prized, especially as its numbers have been so considerably reduced by the competition of Russian, Anglo-Indian, and American traders. This animal was formerly abundant on the islands skirting the north-eastern shores of Asia, Kamtschatka, the Kurile, and the Aleutian isles, but it is now almost limited to the western coasts of North America, extending as far south as California. The fur is purchased principally by the inhabitants of China and Japan. In a morphological point of view, the sea otter may be looked upon as an intermediate form between the fresh-water otters and the true maritime seals; and we also find that in its capacity for capturing fish, it appears to combine the special facilities of either species. It is essentially a marine animal, living very constantly in the open sea, and only frequenting the rocks for repose, and for the occasional purpose of rearing its young. The Russian traveller, Von Kotzebue, has given the following interesting account of the habits and mode of hunting the sea otter:—"They are often seen on the surface of the water, many miles from land, lying asleep on their backs, with their young, of which two are produced at a birth, resting upon them and sucking. The young cannot swim until they are several months old; but the mother, when she goes out to sea in search of food, carries them on her back, and brings them home to her hole in the rocks when she has duly satisfied her hunger. If seen by the hunters during these excursions, the female falls a sure prey to them; for she never forsakes her offspring however much they embarrass her swimming, but, in common with the male, defends them courageously against every attack. The lungs are so constructed that they cannot subsist for more than a few minutes under water, but are necessitated to reascend to the surface for breath. These opportunities are seized by the hunters, who would seldom succeed if the otter could remain long under water, where it swims with great rapidity and skill. The hunters row in the little Aleutian baidars or boats round the coast, and for some miles out to sea, being provided with bows, arrows, and short javelins, which they discharge as soon as they observe an otter. The animal is seldom struck at first; it immediately dives, and as it swims very rapidly, the skill of the hunter is displayed in giving the canoe the same direction as that taken by the animal. As soon as the otter reappears on the water, it is once more fired at, when down it dives again; and the pursuit is thus continued until the creature becomes so weary that it is at length easily struck. Sometimes the otters succeed in tearing out with their teeth the arrows which have wounded them, and often, especially if their young are with them, boldly rush upon the canoes, and attack their persecutors—employing for this purpose their powerful teeth and claws. These conflicts, however, uniformly terminate in the defeat and death of the otter. The hunt is safer when the canoes are numerous, but, with experienced hunters, two boats are sufficient."

FAMILY III.—VIVERRIDÆ.

This family embraces a large section of the Carnivora, but the interest attaching to them being probably less than that accorded to any other subdivision of the Mammalia, we shall consequently devote a smaller space to their consideration. By many naturalists the hyænas are included in this group; yet, as they are clearly osculant between the civets and the cats, it is our intention to consider them as a separate family. The civets, properly so called, have usually forty teeth, their dental formula displaying the ordinary number of incisors and canines seen in the typical Carnivora, but almost invariably presenting twenty-four molars—that is to say, six above and below on either side; and of these, the anterior sixteen are spurious, while, of the remaining eight, six only are tuberculated—a pair of the inferior true molars being carnassial in their character. The tongue is furnished with numerous sharp, rough, horny papillæ, which are directed backwards. The feet are more or less digitigrade, being generally pentadactylous, but in some cases tetradactylous—the claws being slightly raised during progression. Sebaceous glandular follicles exist in the anal region, capable of secreting a more or less disagreeable fœtid matter. The various kinds of viverrine carnivors are widely distributed over the eastern hemisphere. A solitary species of civet, with long hair, large ears, and a small pointed head, is known to inhabit Mexico. The naturalist Lichtenstein has described and figured it under the combined generic and specific title of *Bassaris astuta*.

THE GALET (*Cryptoprocta ferox*).—This creature is about the size of our common stoat. The body is very slender, terminating posteriorly in a long hairy tail, having throughout an almost uniform thickness. The head is narrow; the muzzle being short, with the nostrils deeply notched laterally. The mouth and eyes are comparatively small, more particularly the former. The ears are remarkably large, conspicuous, and hairy; they have an oval outline, the margin being folded upon itself posteriorly; the internal surface is also marked by sinuosities. The whiskers are numerous and strongly developed. The limbs are stoutish, and of moderate length, the anterior pair being rather shorter than the hind ones. The feet are plantigrade and pentadactylous, the soles being naked, and the digits furnished with compressed, retractile, incurved claws; those of the anterior feet being more sharply pointed than the posterior series. The galet is a native of the island of Madagascar. Although plantigrade in its walk, most of the characters above recorded, as well as those of the dentition, serve to indicate a close alliance with the more highly carnivorous cats and dogs. It is to Mr. Bennett that naturalists are indebted for having early described this species in the first volume of the Zoological Society's Transactions.

THE DELUNDUNG (*Prionodon gracilis*) comes so near to the cats in certain particulars, that Dr. Horsfield originally described it as a species of Felis in his valuable "Zoological Researches in Java." It was discovered by him in the district of Blambangan at the eastern extremity of the island in the year 1806. The length of the body is about fifteen and a half inches, not including the tail, which would give us rather more than another foot. A glance at the excellent figure presented in the work above quoted, is sufficient to prove its distinctiveness as a separate species—the body being singularly elongated, vermiform, and rather slimly built. The tail is also very long, cylindrical, and particularly thick at the base, the outline of the rump being prolonged, as it were, into that of the extended caudal development. The head is tapering. and sharply pointed in front. The nose is elongated, naked, and furnished with laterally-placed nostrils. The jaws are provided with thirty-eight teeth of which there are twenty-two molars, five on either side above, and six correspondingly opposed in each series below. The eyes are placed far forward, and have a circular pupil. The ears are rather small, short, rounded, and somewhat irregular at the margin. Long whiskers proceed from the upper lip, projecting backwards beyond the head; others also rise from the angles of the mouth, and from the interspaces between the eyes and ears. The feet are five-toed and digitigrade, being clothed with hair above and below. The digits are provided with minute, sharply-pointed, retractile claws. The delundung is an attractive and elegant species. "On a ground of pale, yellowish-white, which covers the throat, breast, belly, sides, and part of the back and tail, the distinguishing marks of a deep brown colour, inclining to black, are arranged in the following manner:—Four transverse bands, gradually increasing in breadth, cover the back at intervals between the limbs. On the rump are two narrow bands; two longitudinal stripes take their origin, one between the ears, the other near the posterior angle of the eye on each side, and pass, with interruptions at the transverse bands, to the thighs, when they are continued by numerous large spots which cover these parts. From the shoulders and thighs, several obscure stripes pass to the feet, which have a dusky-grey colour. Between the origin of the longitudinal stripes of the body, and the transverse bands of the back, two smaller stripes are placed, which unite on the lower part of the neck from the opposite sides." Little or nothing is known of the habits of the Delungdung beyond such as may be legitimately inferred from its carnivorous structure, and from the circumstance of its being usually found in extensive forests.

THE MEERKAT (*Cynictis Steedmannii*).—Mr. Ogilby first accurately described this species in the Zoological Society's Transactions. It is an inhabitant of the district of Uytenhaye on the borders of Kaffraria. The term meerkat is applied by the South African colonists to signify almost any kind of small quadruped having burrowing habits. The body of the meerkat is about a foot and a half in length, exclusive of the tail which would give another twelve inches. The jaws are furnished with thirty-eight teeth, of which twenty-two are molars, twelve above and ten below; the last two on either side of the upper series, as well as one correspondingly opposed on each side below, being tuberculated. The limbs are slender and comparatively long. The feet are completely digitigrade, and provided with claws adapted to grubbing up the soil. The fore-feet are five-toed; but the hind-feet are tetradactylous. The fur has a bright reddish or chestnut tinge generally, being deeper coloured on the back. The tail is bushy like that of a fox, and shaded with dark-brown hairs, except at the tip, where it is of a uniform dull white. The texture of the fur is smooth, close, and fine. This animal appears to be tolerably abundant in the locality above mentioned, as several travellers have been careful to notice its occurrence. At a time when the meerkats were perhaps totally unknown to Europeans, the African traveller, Barrow, records the following little incident:—"An eagle," he says, "making a stoop at one of these, close to where we were passing, missed his prey, and both fell a sacrifice, one to the gun, the other to the dogs."

THE EGYPTIAN ICHNEUMON (*Herpestes Ichneumon*)—Plate 9, fig. 32. The various members of the genus Herpestes, are, amongst other things, characterized by the possession of forty teeth, of which twenty-four belong to the molar series, the last two on either side above, and the ultimate tooth of each corresponding group below, being tuberculated. The head is furnished with short and rounded ears, and the circumferential osseous ring of the orbital space is in most cases complete. The limbs are short, the feet being pentadactylous and armed with huge, compressed, incurved, and slightly retractile claws. The oval glandular pouch is remarkably capacious. The fur consists of long, rigid hairs, more or less annulated with alternating shades of dark and light tints. The Egyptian ichneumon is the best known of all the species, and is celebrated by Herodotus, Aristotle, and many other ancient writers. All sorts of fabulous stories, mixed with a certain degree of truth, have been told respecting it; but the sober science of modern times very properly rejects such silly records as totally unworthy of belief. By European residents in Egypt the ichneumon is known by the name of Pharaoh's rat; but the native Arabs call it *nems* or *nims*. The traveller Sonnini, whose observations on this animal were made towards the close of the eighteenth century, was one of the first to give an accurate account of these creatures. Speaking of their habits he says that "they feed upon rats, birds, and reptiles. They ramble about the habitations of men; they even steal into them in order to surprise the poultry and devour their eggs. It is this natural fondness for eggs that prompts them frequently to scratch up the sand with the intention of discovering those that the crocodiles deposit there, and it is in this manner that they prevent, in reality, the excessive propagation of these detestable animals." The Egyptian ichneumon is readily domesticated, and specimens of it are always to be seen in living collections in this country. The fur has a peculiar dark tawny-grey aspect, resulting from the circumstance that the individual hairs are coloured with alternating rings of chestnut-brown and yellow. The muzzle and feet have a deep, reddish-brown tinge. The tail is long, thick, and bushy at the root. A full-grown ichneumon is about the size of an ordinary cat. When much excited it is said to growl and even bark.

THE MOONGUS (*Herpestes griseus*).—This animal is also known as the Indian ichneumon in contradistinction to the above-described species; but as there are several other allied forms inhabiting the great Asiatic peninsula and the adjacent islands, it is better to retain the more distinctive appellation here given. The moongus is celebrated for attacking venomous serpents, and it is said to have recourse to the plant called Hampadder-tanah or Mungo-root (*Ophorhiza mungos*) as an antidote to their venom. The plant is still employed as an antidote by the natives; but we do not place much faith in the above-mentioned statement, which was originally recorded and concocted by Rumphius. This animal's astonishing power of destroying vermin, however, has been satisfactorily demonstrated in our own country. Mr. Bennett, in his account of a specimen kept in the tower of London, relates that the beast actually destroyed, on one occasion, no fewer than a dozen full-grown rats which were loosed to it in a room sixteen feet square, accomplishing the slaughter in a minute and a half! The moongus may be readily tamed and taught to accompany its master anywhere, both in and out of doors.

THE GARANGAN (*Herpestes Javanicus*) is a native of Java, and is especially abundant in the large teak forests of that island. Like the last-described species, it is exceedingly destructive to serpents, which it attacks with great fury. Rats appear to be its favourite food; but it is also terribly destructive to chickens. In pursuing its prey it exercises much cunning and ingenuity. It is very easily domesticated; but its propensities for poultry deter the Javanese from showing it much regard. Moreover, it is said to be of a capricious disposition, occasionally indulging in fits of anger and violence. The fur of the garangan or

Javanese ichneumon, as it is sometimes called, is rather darker than that of the moongus and its allies.

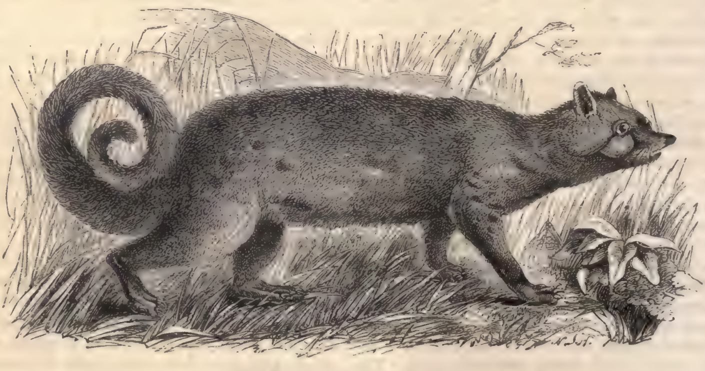
THE RATLAMUCHI (*Herpestes badius*) inhabits the Cape of Good Hope and neighbouring parts of southern Africa. According to Dr. J. E. Gray, the fur is of a "red bay, the hairs being of a uniform colour, except a few just over the shoulder nape, which have a black sub-apical ring." The ratlamuchi, in common with its congeners, is very shy in the wild state, so that only very feeble glimpses can be obtained of it while it hurriedly escapes from one wood to another. There is every reason to believe that it feeds upon rats, mice, snakes, and lizards; but the stomachs of those examples obtained by Dr. Smith, who originally described the species, contained the remains of insects only. In the catalogue of Mammalia preserved in the British Museum, this species is denominated Smith's ichneumon or *Herpestes Smithii.*

THE SURICATE OR ZENIC (*Rhyzæna tetradactyla*) is also a native of southern Africa, and is rather smaller than the Indian moongus, being about four feet long, including the tail, which is rather more than half the length of the body. The suricate possesses thirty-six teeth, twenty being molars, of which the anterior twelve are spurious. The four true grinders of the upper series and the two ultimate ones below are tuberculated. The orbital cavity is surrounded by a complete osseous ring. The ears are small, the muzzle much produced, the tongue being furnished with horny papillæ. The limbs are comparatively long, terminating in tetradactylous feet, whose digits are armed with strongly-developed, compressed, incurved claws. The tail is slender and pointed, and the anal region is supplied with the usual pair of glandular follicles. The fur of the zenic very closely resembles that of the ichneumon in respect of its annulations and peculiar tinting. The colour is a mixture of yellow, white, brown, and black. The inner sides of the legs are yellowish-brown, and the hairs on the back are also darker, while the tail is marked with blackish tufts, especially at the tip. The habits of the suricate are similar to those of its congeners, feeding, as it does, upon rats, mice, &c. It is also reported to be exceedingly destructive to cockroaches.

THE MANGUE (*Crossarchus obscurus*).—This animal was first described by M. Friedrick Cuvier. It is an inhabitant of the district of Sierra Leone, on the west coast of Africa. In respect of size and general appearance it resembles the suricate. The head is more rounded posteriorly than in the ichneumons; but the bony orbital ring is incomplete behind. The muzzle is very much produced or proboscidiform; and the jaws are furnished with twenty molars, the laniaries or carnassials being surmounted with acute conical tubercles. The ears are small, round, and bilobulated. The central papillæ of the tongue are horny. The feet are plantigrade and pentadactylous, while the tail is flattened, of moderate length, but considerably thicker than that of the suricate. In the anal region there is a solitary glandular pouch. The body is only sixteen inches in length, not including the tail, which measures some eight inches. The fur presents a tolerably uniform brownish colour, except on the sides of the head, where it is much paler. The mangue feeds on small quadrupeds, insects, and fruits; and in the domesticated state it is a cleanly docile creature.

THE POUGONNE (*Paradoxurus typus*).—As this animal, in common with several of its allies, is called the *musang*, we purposely retain the subjoined distinctive title. The term Paradoxure, by which it is likewise well known, is also applicable to other species of the same genus; while to employ the name of palm-marten given to it by the French, would involve the same uncertainty, being open to precisely similar objections. The Pougonne (fig. 27), is a native of India, and is quite distinct from the genets, with which, however, it has been frequently confounded. The head exhibits a thoroughly canine aspect, and the muzzle is much pointed. The jaws are supplied with forty teeth, twenty-four of them being molars. The pupil of the eye is slit longitudinally, the ears being rather large and rounded. The body is stoutish, and

Fig. 27.



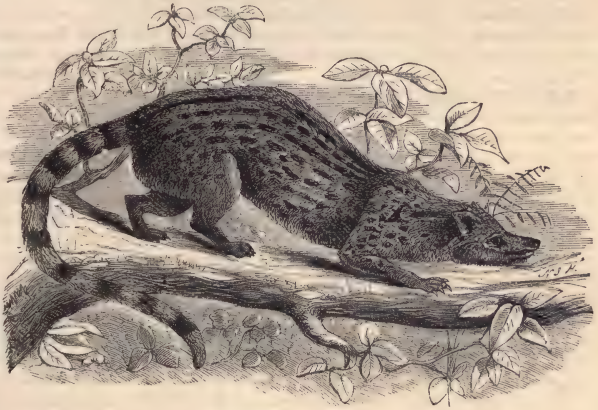
The Pougonne (Paradoxurus typus).

provided with short limbs, the feet being semi-palmate, plantigrade, and pentadactylous. The claws are slightly retractile. The odoriferous secreting pouch is represented by a superficial grandular space, placed a little below the anal opening. The tail is as long as the body, cylindrical, slightly flattened from above downwards, and non-prehensile; in the example described by F. Cuvier it was found spirally folded upon itself, as in the figure here given. The fur of the pougonne has a more or less brownish tint generally, being marked on the back and sides with darker patches of the same colour, somewhat irregularly disposed. Its habits correspond with those of the species of this family whose food is of a mixed character.

THE COMMON GENET (*Genetta vulgaris*), is an inhabitant of the south of France, of Spain, and of the African continent throughout its entire length and breadth. It is generally found in the low grounds, near the edges of rivers, or in the immediate neighbourhood of springs. The Genet very much resembles an ordinary cat, and in the domesticated condition forms a very good substitute, catching and killing mice with equal skill. The various members of the genus Genetta are distinguished by their vertically slit pupils, and by their completely retractile claws, in which respect they approximate very closely to the Felidæ. The odoriferous anal pouches are reduced to a mere depression in the skin, the amount of the secretion being correspondingly deficient; nevertheless quite enough to produce a very perceptible odour. The Genets are smaller than the true civets, and less frugivorous in their habits. The fur of the species under consideration is more or less greyish and spotted, with conspicuous oval, oblong, or rounded patches of a brownish-black colour, the cheeks and sides of the muzzle being covered with white markings. The tail is beautifully annulated with upwards of twenty alternating white and black bands. It is as long as the body, and tapers very gently towards the tip, where it is also clothed with long coarse hair. Its dental arrangement is precisely similar to that of the civets, properly so called.

THE LUWAK (*Viverra musanga*), is a well-marked form, although it resembles the genet in size and many other particulars. The head is broad behind, ending anteriorly in a sharply pointed muzzle. The jaws are furnished with twenty molar teeth, which are comparatively short and broad. The body is about twenty-two inches long, exclusive of the tail, which would give us another foot and a half. The general colour of the fur is that of a deep tawny-brown; the head, central line of the back, tail, and outer sides of the limbs being almost black. A whitish-grey band passes backwards from the eye, gradually increasing in breadth until it arrives at the centre of the neck. The pupils of the eyes are rounded. The limbs are robust, terminating in pentadactylous feet, armed with large, strong, semi-retractile claws. In regard to the habits of the Luwak, Dr. Horsfield states that they are "very similar to those of the genet. If taken while young, it becomes patient and gentle during confinement, and receives readily animal and vegetable food. It requires little attention, and even contents itself with the scanty remains of the meals of the natives, with fish, eggs, rice, potatoes, &c., the structure of its teeth being particularly adapted to a vegetable diet. It prefers, however, delicate and pulpy fruits, but when pressed by hunger, also attacks fowls and birds." The Luwak, we are told, causes terrible damage to the coffee plantations, devouring the berries with excessive greediness. On this account some have called it the "coffee rat." Only the arillus and external coverings of the berry are consumed, the seed itself passing through the animal unaffected by the digestive powers of the animal's stomach. The Luwak is pretty widely distributed, being found in Sumatra, Java, the Malayan peninsula, and in most of the adjacent islands of the Indian archipelago.

Fig. 28.



The Rasse (Viverra Rasse).

THE RASSE (*Viverra Rasse*), is a remarkably handsome creature, and is readily distinguished from its congeners by its elongated form, delicate build, and elegant colouring (fig. 28). It is also a native of Java and the adjoining isles. The length of the body is nearly two feet, not including the tail, which would give us another twelve inches. The head is cuneiform, compressed sideways, terminating anteriorly in a very attenuated muzzle. The ears are particularly broad at the base, closely approximating to each other on the crown of the head. The eyes are dark-coloured. The whiskers are few in number, but of considerable length. The limbs are of moderate size, and terminate in digitigrade pentadactylous feet, armed with acute semi-retractile claws. A solitary glandular pouch exists in the anal region. The general aspect of the fur is tawny grey, prettily marked with dark-brown or blackish spots, in addition to which there are eight dark-coloured parallel bands passing from the shoulders to the posterior extremity of the rump, four of them being situated on either side, and immediately below the central line of the back. The dark spots above mentioned have also a tendency to arrange themselves in linear series. The tail is striped with sixteen circular alternating bands of a black and whitish-grey colour. The Rasse "preys on small birds and animals of every description. It possesses the sanguinary appetite of animals of this family in a high degree, and the structure of the teeth strictly corresponds with its habits. In confinement it will devour a mixed diet, and is fed on eggs, fish, flesh, and rice. Salt is reported by the natives to be a poison to it." The odoriferous secretion from the anal glands is termed *dedes* by the Javanese and *jibet* by the Malays, and Dr. Horsfield further informs us that it is quite a "favourite perfume among the Javanese, and applied both to their dresses, and, by means of various unguents and mixtures of flowers, to their persons. Even the apartments and the furniture of natives of rank are generally scented with it to such a degree as to be offensive to Europeans, and at their feasts and public processions the air is widely filled with this odour."

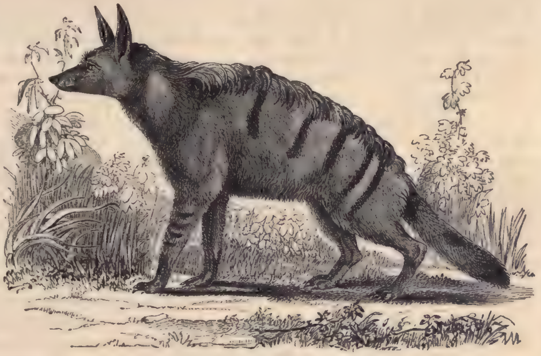
THE TANGGALUNG (*Viverra zibetha*) is a very widely distributed species throughout the more southern portions of the great Asiatic continent, extending from Arabia on the west to the coast of Malabar on the east, and also occupying Sumatra, Java, Borneo, and other islands of the Indian archipelago. The term Tanggalung is of Malayan origin; but this species is also called the Indian civet, and by the native Hindoos is known by the name of the *Kutauss*. It is a comparatively strong and bulky species, having a short thick neck and somewhat rounded head. The ears are very much wider apart than obtains in the Rasse, leaving an interspace of about two inches width. The tail is cylindrical, nearly uniform in thickness, and shorter than the body; it is somewhat indistinctly striped with alternating black and light-brown rings. The fur has a light-brownish ashy-grey colour, being marked with small black spots arranged in a transversely undulating manner. The throat and lower parts of the belly are whitish. Dr. Horsfield says that this animal has a comparatively mild disposition; but his remarks evidently apply to it when in a semi-domesticated condition. Captain Thomas Williamson's account of the wild Indian civet affords a clearer estimate of its naturally ferocious character. "This animal," he says, "is perhaps the most obnoxious of all the wild tribes known in India. It is seldom, if ever, seen on a plain, except at night, when it leaves its haunt in quest of prey. The Kutauss is remarkably bold, sparing nothing which it can overcome, and frequently killing, as it were, merely for sport. Its principal devastations are among sheep and swine, from which it purloins the young, and commits dreadful havoc among poultry. To the rapacity of the wolf it joins the agility of the cat and the cunning of the fox." The same excellent observer tells us that it "is generally found in short underwood covers, mixed more or less with long grass, and especially where the palmyra or cocoa tree is to be seen. Although it is sometimes met with in various detached jungles, yet, for the most part, its residence is confined to such as border old tanks or jeels. The banks being formed by the excavation, are often very high and broad; with time they settle and become flatter, and are generally overrun with very strong brambles, through which even an elephant could not make his way without extreme difficulty. Of such covers the Kutauss is a regular inhabitant, seldom stirring in the day, during which time he appears to hide himself in the most opaque recesses." The Kutauss ascends trees with facility, and when chased by hunters makes a very powerful resistance. The odour which it emits is similar to that of the Rasse, and, like the jibet, is duly extolled by the natives as a delightful perfume. It is, however, highly offensive to Europeans, and Captain Williams states that the hunters' dogs in Bengal become perfectly sick with the stench; nevertheless there is no animal which they will so readily attack, and after they have worried a Kutauss nothing will induce them to pursue any other kind of game—until at least the smell of the beast has entirely quitted their nostrils. Kutausses only frequent the neighbourhood of such villages as are inhabited by Mussulmans, simply because no poultry can be stolen from those populated by Hindoos, whose religion forbids the rearing of chickens and fowls. Unclean animals all!

THE AFRICAN CIVET (*Viverra civetta*)—Plate 9, fig. 31—is the species most commonly known, and it is from this animal that the unctuous brown substance termed "civet" is chiefly procured. The fatty matter in question is obtained from the two anal glandular pouches, so frequently alluded to in other viverrine genera. In the fresh state its odour is extremely disagreeable; but when very copiously diluted and mixed with other perfumes—the energy of which it appears to have the power of augmenting—the combination is considered pleasant. The Civet is most abundant in North Africa; but it is also found on the coast of Guinea and at other parts of the continent as far south as the Mozambique. In the domesticated condition this animal exhibits a very capricious temper; but large numbers of Civets are kept for the sake of procuring the oily perfume. We are told that the unfortunate captives have their dignity insulted about twice a week. Thus, the tails being raised, and the hinder parts fixed to the bars of their cages *in situ*, a sort of iron scoop is unceremoniously introduced into the before-mentioned pouches, and the glands are relieved of their odoriferous contents. The African civet is larger than the Tanggalung, the body being nearly three feet long, not including the tail, which measures about eighteen inches. The fur has a light brownish-grey colour, with spots and bands of a darker brown or blackish tint. The hairs along the central line of the back and neck are sufficiently elongated to form a kind of mane, which can be raised or depressed at will. The hairs of the tail are also long, and being whitish with black ends, they impart to the organ a more or less ringed appearance. The habits of the African civet are by preference nocturnal. It is a good climber, and although particularly fond of birds and small quadrupeds, it does not reject fruits, roots, and other vegetable matters.

Family IV.—HYÆNIDÆ.

In a zoological point of view, this family cannot be considered as equivalent to any of the three foregoing carnivorous groups. It is clearly osculant between the Viverridæ and Felidæ, resembling the cats in its dental formula, and the civets in nearly all other respects. In addition to the usual six incisives and four canines, the Hyænas have eighteen molars, of which the anterior fourteen, that is, eight above and six below, are, according to the view of Professor Owen, spurious; whilst, of the four remaining true molars, the upper pair are tuberculated, those of the lower series remaining sectorial in their character. The Hyænas are further distinguished by their peculiar gait, depending upon the paramount lengthening of the anterior limbs as compared with the hind legs. This elongation is perhaps, on the whole, more apparent than real; nevertheless, taken separately, the tibia and fibula of the posterior extremity are shorter than the corresponding radius and ulna of the fore-limb. The feet are all tetradactylous. The ears are large, the eyes prominent, and the tongue covered with horny papillæ. The body gradually declines from the shoulder towards the tail, supporting a bushy mane on the neck and central line of the back. There are fifteen or sixteen pair of ribs. The tail is rather short, the anal glandular pouches being deep and capacious. So far as at present known, this family is exclusively confined to the eastern hemisphere. Numerous fossil remains of Hyænas occur in the pliocene deposits, and more particularly in the ossiferous caverns of Great Britain and central Europe.

Fig. 29.



The Aard-Wolf (Proteles Lalandii).

THE AARD-WOLF (*Proteles Lalandii*)—fig. 29.—This is a very interesting animal, inasmuch as it constitutes one of those transitional or aberrant forms which serve to demonstrate the unity of plan pervading all organized beings. The various species which inhabit this planet, whether animal or vegetable, are not to be regarded as creations representing so many totally different designs, but they are rather to be looked upon as special modifications of one common archetypal plan. Speaking of secondary causes, we may say that nature developes progressively, and in accordance with the motto, "*Nihil per saltum.*" Such a view is at the same time quite consistent with the notion that each animal—the Aard-wolf, for example—is an independent entity, a distinct species, a separate creation, an expression of the Divine will. Observe how closely this creature resembles several other allied forms. In general appearance and attitude it is like the true hyænas, and this apparent identity is perhaps even more obvious in the dentition and in the structure of the skeleton. In respect of its size, the form of the head, and in the circumstance of its excavating burrows for diurnal retreat, we notice its fox-like qualities, while in several other particulars it approaches the civets. The molars are small, and vary in number from sixteen to twenty. The fore-feet are pentadactylous, having the digit of the thumb slightly raised. The hind-feet have only four toes. The tail is comparatively short. The texture of the fur is soft and woolly, except along the central line of the back and neck, where it is long and rigid, and forms an erectile mane, the individual hairs being upwards of six inches long. The body displays a yellowish ashy-brown colour, the sides being irregularly banded with eight or ten dark-brown stripes, whilst the legs are also lined with similar transverse markings. Like its congeners, the habits of the Aard-wolf are nocturnal, and it feeds on various kinds of animal and vegetable food, and from the observations of Sparrman, appears to be very partial to ants, thus reminding us also of the insectivorous habits of the bears. On the approach of daylight he retires to his self-constructed subterraneous burrow, and there lies concealed during the day. Aard-wolves are remarkably timid and shy; and, as if to increase their security, they not only make their burrows near each other, but many are frequently found occupying the same hole, which, however, may have several outlets, so that they can all escape if disturbed. They are thus gregarious in their habits, and are also swift runners, notwithstanding the disproportion which exists between the anterior and posterior extremities.

THE STRIPED HYÆNA (*Hyæna striata*)—Plate 9, fig. 30.—This is the most widely distributed species, being found in abundance in the greater part of central Asia, Hindoostan, Asiatic Turkey, Persia, Syria, and northern Africa. It is recognized by its brownish-grey colour, which is darker along the central line of the back and neck, where the hairs are prolonged to form an erectile mane, the sides of the body being also marked by several dark-brown bands. All the hyænas display remarkable strength and voracity, their jaws being eminently fitted for tearing and crushing the hardest substances. At night they prowl about in large numbers, devouring alike living and dead animals, whether the latter be fresh or semiputrid. Graves are torn open without ceremony—a circumstance which has given rise to various superstitions and silly tales, which ancient writers ignorantly delighted to record. The Striped hyæna is not very particular as to the character or size of his victim. Colonel Denham, when at Kouka, informs us that a legion of this species literally stormed a large village in that neighbourhood one night, and, notwithstanding that the place was surrounded by a barricade, consisting of branches of the prickly tulip nearly six feet in height, they succeeded in throwing it down and taking away two donkeys. He adds—"We constantly heard them close to the walls of our own town at nights, and on a gate being left partly open, they would enter and carry off any unfortunate animal that they could find in the streets." It has often been stated that hyænas cannot be tamed —a notion which is entirely erroneous. Among the very many proofs which have been adduced to show that the species under consideration is quite capable of domestication, we may refer to Mr. Bennett's account of a Striped hyæna kept in the tower of London, which manifested remarkable docility and attachment to its keeper. It may also be mentioned, on the authority of Colonel Sykes, that in central India, where the species is numerous, they are found to be as susceptible of domestication as ordinary dogs.

THE SPOTTED HYÆNA (*Hyæna crocuta*).—This is called the "Tiger-wolf" by the colonists at the Cape of Good Hope, and it is often spoken of simply as the Wolf, in contradistinction to the next species, which is termed the Strand-wolf. Though most abundant in Southern Africa, the Spotted hyæna is found as far north and west as the coast of Guinea and Senegal, and even Barbary, if the statements of Lesson are correct. It is rather smaller than the last-described species, and is further distinguished by the absence of any well-marked mane, as well as by the circumstance that the fur is covered with roundish black spots, instead of stripes, which, nevertheless, exhibit a tendency to arrange themselves in linear series. The general colour of the fur is yellowish-brown, the hairs being comparatively short. The tail is bushy, and of a brownish-black tinge. The habits of the Spotted hyæna appear to be even more destructive than those of the striped species. Numerous accounts have been placed on record respecting its extraordinary rapacity, but of these we shall refer only to the more interesting. The traveller Steedman gives the following account of its depredations, as communicated to him by a trustworthy correspondent, who writes from Mamboland as follows:—"To show clearly the preference of the wolf (*i.e.*, Spotted hyæna) for human flesh, it will be necessary to notice, that when the Mambookies build their houses, which are in form like beehives, and tolerably large—often eighteen or twenty feet in diameter—the floor is raised at the higher or back part of the house, until within three or four feet of the front, where it suddenly terminates, leaving an area from thence to the wall, in which every midnight the calves are tied, to protect them from the storms or from wild beasts. Now it would be natural to suppose, that should the wolf (hyæna) enter, he would seize the first object for his prey, especially as the natives always lie with the fire at their feet; but notwithstanding this, the constant practice of this animal has been in every instance to pass by the calves in the area, and even by the fire, and to take the children from under the mother's kaross; and this in such a gentle and cautious manner, that the poor parent has been unconscious of her loss, until the cries of her little innocent have reached her from without, when a close prisoner in the jaws of the monster." The same writer avers, that there had come to his knowledge no less than forty instances where these beasts had thus committed serious havoc within the space of only a few months. The Spotted hyæna is a great coward, for he will usually only attack his intended victim after he has succeeded in intimidating him, and in making him run for his life. To bring about this result, he utters hideous howls, and puts on every kind of snarl and grimace which his villanous physiognomy can conjure up. This propensity to howl, however, seems to be rather disadvantageous than otherwise, seeing that it serves as a warning to the occupants of farm-yards and villages. Its design is probably to inspire terror, and not to call together other hyænas of the same species, as some have supposed. Various methods are adopted to destroy this pest, the best of which seems to be that of a spring-gun trap, set in the following manner:—"Two young trees are selected, and divested of their lower branches, or, in lieu of such, a couple of stout posts, firmly driven into the ground, will answer the purpose equally well. To these trees or posts, as the case may be, the gun is firmly lashed in a horizontal position, and with the muzzle pointing slightly upwards. A piece of wood about six inches in length—the lever, in short—is tied to the side of the gun-stock, in such a manner as to move slightly forwards and backwards. A stout piece of string connects the trigger with the lower part of the lever. To the upper extremity of the latter is attached a long piece of cord, to the outer end of which, after it has been passed through one of the empty ramrod tubes, is tied a lump of flesh, which is pushed over the muzzle of the gun." By this contrivance Mr. Anderson and his friends succeeded in destroying several hyænas. The same sportsman and author records in his "Lake Ngami" the following curious incident. While stationed at Great Namaqua-land, he says—"Almost the first animal I saw at this place was a gigantic 'tiger-wolf,' or Spotted hyæna, which, to my surprise, instead of seeking safety in flight, remained stationary, grinning in the most ghastly manner. Having approached within twenty paces I perceived to my horror, that his fore-paws, and the skin and flesh of his front legs, had been gnawed away, and that he could scarcely move from the spot. To shorten the sufferings of the poor beast, I seized my opportunity, and knocked him on the head with a stone;

and, catching him by the tail, drove my hunting-knife deep into his side. But I had to repeat the operation more than once before I could put an end to his existence. I am at a loss how to account for his mangled condition. It certainly could not have been from age, for his teeth were good. Could it be possible that from want of food he had become too weak for further exertions, and that as a last resource he had attacked his own body? Or was he an example of that extraordinary species of cruelty said to be practised by the lion on the hyæna, when the latter has the insolence to interfere with the monarch's prey?" We are inclined to believe neither of these ingenious views are correct, but that the poor beast had gnawed its limbs on account of some local disease. We noticed, a few years ago, an unfortunate hyæna in the Dublin Zoological Gardens, which, from some local irritation at the part, had, by constant biting and sucking, so reduced its caudal appendage, that scarcely any trace of the tail remained. We suggested to Dr. Ball that it should be destroyed, but that distinguished naturalist did not seem inclined to adopt Mr. Andersson's judicious method of consoling the afflicted; expressing his belief that the animal would get better!

THE WOOLLY HYÆNA (*Hyæna villosa*). — This species was first described by Dr. Andrew Smith in the 15th volume of the Linnæan Society's Transactions. It is called the "Strand-wolf" by the Cape colonists, and, when young, bears a very close resemblance to the striped hyæna, from which circumstance some have stated that the latter is also found in South Africa. This is not the case, unless, indeed, the persuasion that the Woolly hyæna is nothing more than a well-marked variety of the species under consideration, should gain universal acceptance. The distinguished author of the "Catalogue of Mammalia," preserved in the British Museum, entertains this view. In the meantime we may observe, that a fourth kind has been described—the Brown hyæna (*Hyæna rufa*)—which is also a South African species. The fur of the Woolly hyæna is long and coarse, but it does not form an erectile mane along the central line of the back. The body has a greyish-brown colour, with indistinct markings of a darker hue, transversely arranged on the sides and hips, and other more conspicuous ones on the legs. The tail has a deep-brown tinge, and is longer than in the ordinary striped hyæna. The head is lined with dark patches beneath the eyes, on the chin, and at the point of junction of the cheeks and neck. The ears are comparatively large, straight, and pointed. Its habits are similar to those of other hyænas, but it frequently resorts to the sea-coast, where it greedily devours carcases of whales, and the semiputrid remains of any other animals which by chance may have been washed ashore. It is not so common a species as the spotted hyæna.

FAMILY V.—CANIDÆ.

The Dogs form a small natural group, although the individual members of the family are extremely numerous, owing to the circumstance that a solitary species has given origin to a multitude of well-marked and more or less permanent varieties, forming a series of domesticated races. Besides the ordinary complement of twelve incisive and four canine teeth, the dogs are usually furnished with twenty-six molars, but in some instances as many as thirty-two have been present. Ordinarily, there are six molars on either side above, and seven correspondingly opposed below. Of these, the last pair on either side, above and beneath, are generally tuberculated; sometimes the latter three of each series are thus characterized. The tongue is soft, and not armed with horny papillæ. The feet are digitigrade, and furnished with five toes in front, but the hind limbs are, in most cases, only tetradactylous. Dogs have no anal glandular pouch. The cœcum is well developed, and of a spiral form. These animals are found in all parts of the habitable globe. Fossil remains of dogs and wolves have been found in the bone-caverns of Liége, and also in England, at Overton near Plymouth, and at Paviland in Glamorganshire. A careful examination of these fossils has led Professor Owen to advocate the view, that all the varieties of dogs are specifically identical with the common Wolf.

THE MARBLED LYCAON (*Lycaon venatica*).—This is the wild dog or Wilde Hond of the Cape colonists. In external appearance it very closely resembles a hyæna, and it was originally described by Burchell as a member of that genus, under the title of *Hyæna picta*. It is, however, a nearer approach to the true dogs. This is more especially seen in the character of the dentition, and in the structure of the skeleton. Its height at the shoulder is rather under two feet from the ground, but it looks somewhat taller at first sight on account of its slight, gaunt figure. The limbs are long and narrow, all of them terminating in tetradactylous feet. The fur has a yellowish-brown colour, and is irregularly marbled with black and variegated spots of an exceedingly irregular shape. The head is like that of a hyæna; the muzzle is pointed, and of a black colour. The ears are remarkably large. The tail is moderately long, bushy like that of a fox, and divided near the middle by a black ring, above which the colour is sandy, and white below. According to Mr. Burchell, from whose description these characters are partly derived, the Lycaon hunts in large organized packs, by preference at night, but occasionally also by day. It appears to be a bolder animal than the hyæna, very swift of foot, attacking sheep openly, but employing more caution in the case of horses and large cattle.

THE LALANDE (*Otocyon Lalandii*).—This animal is rather smaller than an ordinary fox, and is also an inhabitant of Southern Africa. The fur is greyish. The tail is moderately long, bushy, black at the upper part, and also at the extremity. The body stands comparatively high, the limbs being lengthy and slender. The head is furnished with remarkably large, long, and straight ears. The teeth are forty-eight in number, there being no less than thirty-two molars. One of the most distinctive peculiarities of the Lalande has reference to the character of these molar teeth, fifteen of which are tuberculated—all the true grinders, in short, four of them belonging to each lateral division above, and three correspondingly opposed in each series below. The food of the Lalande is principally frugivorous.

THE FENNEC (*Vulpes Zerda*)—Plate 7, fig. 25—is more closely allied to the foxes and true dogs, with which, indeed, its dentition entirely coincides. It resembles the foregoing species chiefly in respect of its ears, which are extremely long, and in the circumstance of its slight build and small body. The tail is well developed, and dark-coloured at the root and tip; but in other respects it partakes of the general colour and character of the fur, which is of a whitish, fulvous, or light isabel tint throughout, being almost white beneath the belly. Its texture is fine and woolly. The Fennec is an inhabitant of the sandy plains of Nubia, where it excavates burrows. It also ascends trees with facility. A specimen in possession of Mr. Brande, the Swedish consul at Algiers, was particularly partial to dates and other sweet fruits, and also to eggs. The sight of a bird, however, was sufficient to produce violent excitement. The Fennec does not nestle in trees as the traveller Bruce supposed.

THE COMMON FOX (*Vulpes vulgaris*)—Plate 7, fig. 26.—If the "Museum of Natural History" were exclusively devoted to the consideration of those animals which afford sport, in the ordinary acceptation of the term, our readers would in this place probably expect a brilliant record of daring leaps and other adventures, which are the ordinary accompaniments of the chase after a fox. Due regard, however, being paid to the habits of the more rare and important quadrupeds of foreign countries, we must necessarily limit our details respecting such natural history and sporting data as the records of the fox-hunter furnish; moreover, special works are devoted to this subject, as well as to other matters of interest connected with it. Who is not familiar with the common fox, with its rufous brown fur and bushy tail—or "brush," as it is termed by hunters—tipped with white? The sharp muzzle, the shrewd look, the penetrating eye with its elliptically contracted pupil, the triangular pointed ears, the fetid odour, and the cunning step—these, and many other well-known features, are characters by which Reynard may be easily distinguished. Associated with this aspect and attitude, we may also be reminded of its burrowing propensities, its power of eluding pursuit, its skill as a poacher, its swiftness of flight, its sagacity in detecting traps, its wily instinct in securing food, &c.—peculiarities which have over and over again been celebrated in story-books from the earliest times; neither need any doubt be entertained of the general correctness of those serious charges which have from time to time been laid at its door, or, as a hunter would say, at the entrance of its "earth." Notwithstanding all this, Reynard has many friends among English gentry, although it cannot be urged that this friendship is in any degree disinterested. On the contrary, Reynard is esteemed only for the sport he creates. However destructive he may prove among the occupants of a farmyard, woe betide the tenant-farmer who ventures to destroy him, and so possibly abridge his landlord's pastime. Let Reynard devour hares, rabbits, pheasants, partridges, ducks, geese, chickens, and whatever else he may please to lay his claws upon; but kill him not, lest the tread of the noble fox-hunter's steed be obliterated from the upturned soil! Through this barrier of hunting etiquette, however, a breach is sometimes made; and not long ago the author of the present section of this work was visiting a gentleman at Attleborough in Norfolk, who, when out shooting on a nobleman's estate in the same county, deliberately—with his host's consent and approbation—rolled over a pair of foxes, one with the right-hand barrel, and the other with the left! As may be supposed, such a clever feat of arms gave considerable offence to the fox-hunting gentry of the district, while the farmers and lovers of partridge-shooting only offered their congratulations. The common fox is widely distributed over Europe, and is also found, according to several authorities, in Egypt and other parts of Northern Africa.

THE AMERICAN RED FOX (*Vulpes fulvus*) has been considered by many as a mere variety of the common species above described; there is, however, good ground for believing this view to be erroneous. According to Mr. Sabine's description, this animal exhibits "a general bright ferruginous colour on the head, back, and sides, less brilliant towards the tail; under the chin white; the throat and neck a dark-grey; and this colour is continued along the first part of the belly in a stripe of less width than on the breast; the under parts, towards the tail, are very pale red; the fronts of the fore-legs and the feet are black, and the fronts of the lower part of the hind-legs are also black; the tail is very bushy, but less ferruginous than the body, the hairs mostly terminated with black, and more so towards the extremity than near the root, giving the whole a dark appearance; a few of the hairs at the end are lighter, but it is not tipped with white." We can testify to the accuracy of this description of the fur, having ourselves not only carefully examined several examples, but having also dissected a specimen. Speaking of its habits, Sir John Richardson states that the American Red fox is not so swift as its English congener. It runs rapidly for a short distance, "but its strength is exhausted in the first burst, and it is soon overtaken by a wolf or a mounted huntsman. Its flesh is ill-tasted, and is eaten only through necessity." The female produces four young at a birth, the cubs having a soft downy fur of a yellowish-grey colour. The Red fox is very abundant in the well-wooded districts of North America, many thousand skins being annually imported into England by the Hudson's Bay Company.

THE KIT-FOX (*Vulpes cinereo-argentatus*) is also a North American species, extending from the plains of the Saskatchewan territory to those of Columbia. It is a very small species, measuring about twenty-two inches in length, exclusive of the tail, which would give us nearly another foot. Its face and muzzle are comparatively short and broad. On the upper part of the body the fur presents a peculiar colour, "produced by an intermixture of hairs tipped with brown, black, and white." Underneath the neck and belly it is of a dull rufous orange colour, the hairs in this situation being also longer. The lower parts of the face about the mouth are whitish, and more or less tinged with blackish-brown at the margins. The whiskers are strongly developed and dark-coloured. The tail is bushy, of a yellowish-grey colour, gradually tapering towards the extremity, where it is black.

THE ARCTIC FOX (*Vulpes lagopus*) is as commonly known by the designation of Blue fox, on account of its peculiar deep ashy, leaden, or bluish-coloured hair. The fur varies much in appearance at different periods of the year, and according to the place of abode; being very commonly of a brownish-grey colour in some districts, and in others sooty or almost black. In the winter the fur usually becomes pure white or whitish-yellow; but this is not invariably the case, as the sooty variety is said scarcely to alter its colour in any respect; its texture is woolly, the individual hairs being comparatively long. The Arctic fox is considerably less than our European species, the tail being well developed and very bushy towards the tip. The ears are short and rounded, having a cropped appearance owing to a peculiar arrangement of the hairs; the latter are particularly thick and long at the posterior part of the cheeks. According to Captain Lyon, "the Arctic fox is an extremely cleanly animal, being very careful not to dirty those places in which he eats or sleeps. No unpleasant smell is to be perceived, even in a male, which is a remarkable circumstance. To come unawares on one of these creatures is, in my opinion impossible; for even when in an apparently sound sleep, they open their eyes at the slightest noise which is made near them, although they pay no attention to sounds when at a short distance. The general time of rest is during the daylight, in which they appear listless and inactive; but the night no sooner sets in than all their faculties are awakened; they commence their gambols, and continue in unceasing and rapid motion until the morning. While hunting for food they are mute; but when in captivity or irritated, they utter a short growl like that of a young puppy. It is a singular fact that their bark is so modulated, as to give an idea that the animal is at a distance, although at the very moment he lies at your feet." The same gentleman observes, that when taken they at first display great anger, but after a few hours' confinement they gradually cool down to a state of easy quietude; instances also occur where they have become quite tame. The Arctic fox displays far less cunning than our European species, and is not so suspicious of traps. The female produces from three to five young at a birth. This animal is an inhabitant of the sub-polar regions of either division of the Northern hemisphere, being found in North America, Lapland, Iceland, Siberia, and Kamtschatka. We have also been informed by a Russian gentleman from the neighbourhood of Archangel, that the sport of hunting blue foxes is particularly excellent in the large isles of Nova Zembla. Ordinarily, Arctic foxes are captured by an elevated pit-fall, the pit consisting of an elevated hut built up with stones, and arched over, leaving only an aperture at the summit, over which blades of whalebone are fixed in such a manner as to insure the certain precipitation of the fox into the interior, should the bait, also placed at the upper part, successfully allure him on to the top of the roof. In the young state, the flesh of the Arctic fox is stated to be excellent eating. The fur is employed as an article of commerce, the bluish or lead-coloured variety being most esteemed. In the peculiar dialect of the American Cree Indians, this animal rejoices in the unutterably euphonious name of *Wappeekeeshew-makkeeshew!*

THE INDIAN FOX (*Vulpes Bengalensis*).—This is a small and elegant species, having a brownish fur, which is much darker along the middle line of the back, forming a longitudinal sooty-coloured band; the tail is also tipped with black, and the species is further distinguished by the presence of circular patches of white round the eyes. According to the experienced testimony of Captain Williamson, these foxes are extremely numerous in India. In general their earths are placed on rising grounds, to prevent their being inundated. The holes are "remarkably small, and may be opened in an hour by any common labourer. The foxes are very cunning, at least as much so as their brethren in Europe. I have several times known them, when pushed hard by greyhounds, to conceal themselves in rice fields, or among bulrushes, &c., with only their noses peeping out of the water. On such occasions, unless there be some questing dog at hand, Reynard will often escape unnoticed. Both jackals and foxes sham death to admiration. After having been almost pulled to pieces by dogs, and left to all appearance lifeless, they sometimes gradually cock their ears, then look askance at the retiring enemy, and, when they think themselves unobserved, steal under a bank, &c., and thus skulk along till they find themselves safe, when, setting off at a trot or canter, they make the best of their way to some place of security." The Indian fox feeds principally on small birds and quadrupeds, especially rats, mice, and such like vermin; he is likewise partial to fowls, poultry, and game, but to secure them he rarely ventures within the walls of any village or town.

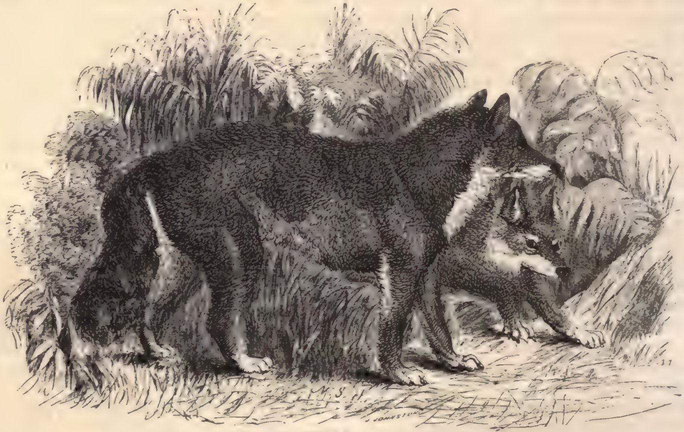
THE JACKAL (*Canis aureus*)—Plate 8, fig. 27—differs from the fox, in presenting a more dog-like appearance. The fur exhibits a ruddy yellowish-grey colour generally, being darker on the back, where it is almost black. The throat and under parts of the belly are much lighter. The ocular pupils are rounded, as in dogs. The common Jackal is widely distributed throughout eastern countries, being found in abundance in Hindoostan, Persia, Tartary, the Caucasus, Dalmatia, the Morea, Palestine, Egypt, and North Africa, as far as the coast of Guinea. In respect of size it is intermediate between the fox and the wolf. Its habits are gregarious; it hunts at night in packs, and, from its piercing yells and destructive habits, is everywhere regarded with horror. The united cry of a pack produces a most unearthly sound, which has been compared to the distant rolling of thunder. Captain Williamson records many facts which clearly prove that jackals will combine to defend or rescue one of their number. Among these he mentions the following incidents:—"Mr. Kinloch, who was well known as an excellent sportsman, and who, when at Midnapore, kept a famous pack of hounds, having one morning chased a jackal, which entered a thick jungle, found himself under the necessity of calling off his dogs, in consequence of an immense herd of jackals which had suddenly collected on hearing the cries of their brother, which the hounds were worrying. They were so numerous that not only the dogs were defeated, but the jackals absolutely rushed out of the cover in pursuit of them; and when Mr. Kinloch and his party rode up to whip them off, their horses were bit, and it was not without difficulty a retreat was effected. The pack was found to have suffered so severely, as not to be able to take the field for many weeks." The same writer speaks of the Jackal as an extremely troublesome customer. He is exceedingly vigilant, and seldom fails to carry his purpose. In spite of your efforts to scare him away, even with the aid of fire-arms, he will perseveringly "wait at your door, nay, will enter your house, and avail himself of the smallest opening for enterprise; he will rob your roost, and steal kids, lambs, pigs, and sometimes even take a pup from its sleepy mother; he will strip a larder, or pick the bones of a carcase—all with equal avidity. It is curious to see them fighting almost within reach of your stick, for proximity to expected booty. It may readily be supposed that when any meat or poultry is purloined by servants, the Jackal bears the blame. An officer in our battalion in one night lost twenty-seven fowls from the hut in which they were kept; on which one of his servants did not hesitate to declare that, on hearing their uproar during the night, he had run to see what was the matter, and saw twenty-seven jackals, each bearing away his bird!" Jackals, as we have seen, will devour any kind of offal, and it is credibly stated that they will dig up and greedily feed upon the half-buried corpses of a battle-field. The odour of the Jackal is very offensive, but it appears to wear off in the domesticated animal. The matter which gives rise to the disagreeable smell is secreted by a gland at the base of the tail. This dermal or skin gland was at one time supposed to exist only in the foxes, until a distinguished comparative anatomist—Professor Retzius, of Stockholm—showed that this organ occurs in wolves and jackals also. It is not necessary to place the slightest reliance in the old story about jackals acting as purveyors to the lion, there being no sufficient grounds for such a notion.

THE WOLF (*Canis lupus*), Plate 7, fig. 24.—Probably no wild animal is more dreaded in civilized countries than the common Wolf, its ferocity and strength having very often proved disastrous to the traveller, and to the residents of outlying villages. Its general appearance is too well known to require any lengthened description. The body is about four feet long, exclusive of the tail, which measures from fourteen to eighteen inches, according to circumstances. The straight direction and dependent position of this organ has been considered as a character sufficiently important to distinguish the wolf from the dog; but when those who argue for the specific distinctness of the two animals are thus obliged to resort to such trifling characters, it shows the very slender nature of the grounds on which their arguments are based. Without regarding the point in dispute as entirely decided, we strongly adhere to the view of Professor Owen and others, who regard all kinds of dogs as domesticated varieties of the wolf. The fur of the Wolf is long, especially on the throat and below the ears; its texture rough, wiry, and harsh. Ordinarily it is of a yellowish-grey colour, being much lighter beneath the neck and belly. Some varieties are dark, almost pure black. In northern regions the fur becomes light-coloured during the winter, and is very frequently quite white; yellow and pied varieties have also been described. There are indeed many wolves differing very markedly in size and colour, and it is quite impossible to determine accurately how many of them represent distinct species. Even if this were the proper place to discuss the matter, our space would not allow a full and complete discussion of the subject. The black variety is very common in the south of Europe, especially on the Spanish side of the Pyrenees. They are very large, tall, and strong in that quarter, and their habits are excessively crafty. Colonel Hamilton Smith says, that they formerly congregated "in the passes of the Pyrenees in large troops; and even now the Lobo will accompany strings of mules as soon as it becomes dusky. They are seen bounding from bush to bush by the side of travellers, and keeping parallel with them as they proceed, waiting an opportunity to select a victim, and often succeeding, unless the muleteers can reach some place of safety before dark, and have no dangerous passes to traverse." These black wolves are likewise to be found in the mountain slopes of Friuli and in the neighbourhood of Cattaro. The common grey variety is very widely distributed, occurring in various parts of Europe, Asia, Africa, and North America. In early historic times it roamed at large in the forests of Great Britain, as abundantly, perhaps, as it now occurs in some districts of France, Hungary, Russia, Norway, and Sweden. Their rapacity is much increased during the winter months, especially if the cold season prove unusually severe and protracted, when the supply of food necessarily becomes limited. On these occasions their depredations prove most disastrous. Thus, Dr. Weissenborn informs us, that in one severe winter on the continent, they became remarkably bold and violent. About the middle of the month of January large numbers infested the neighbourhood of Stuttgard, where they succeeded in capturing a poor lad, twelve years of age, only a few miles outside the city. At night they prowled about in packs; and one batch of them, ten in number, having forced their way into a farmyard near Agram, they committed most serious havoc among the cattle. Many crossed over into Prussia from the Polish frontiers, and a solitary individual deliberately attacked a horse in one of the busiest and principal streets in the city of Königsberg. Many other instances have been given of their daring under the extremities of famine. The most horrible account is that recorded by Captain Williamson in Northern India. On this occasion their want of food was not the result of cold, but it was owing to the extreme drought of the year 1783, which caused a dreadful scarcity of all kinds of food and animals during the ensuing season. This famine was especially felt in the fertile province of Oude. Thousands of the natives, we are told, perished from starvation, "while numbers fell an easy prey to the wolves, which, being bereft of their usual means of subsistence by the general destruction of all eatable animals, were at first compelled, and afterwards found it convenient, to attack the wretched wanderers. The little resistance they experienced in their depredations on these unfortunate creatures, emboldened them in an astonishing manner, and taught them to look with contempt and defiance towards a race, of whose powers they had heretofore been in awe. Such numbers, however, succeeded in finding their way to the cantonments, that we were to all intents in a state of siege. The wolves followed, and were to be seen in all directions committing havoc among the dying crowd." Here we have indeed a sad picture; for the very loss of food these animals experienced by the general scarcity of other creatures, was more than amply compensated to them by the abundance of perishing men, women, and children. For the latter, indeed, the Wolf has a remarkable propensity at all times. The same writer declares that "his favourite object is a child at the breast, which, when opportunity serves, he seizes by the throat, thereby not only preventing it from giving the alarm by its cries, but taking a hold such as enables him to bear away his prize without impeding his progress." Very few children, even if timely rescued, survive this trenchant grip. On another occasion two wolves gained access to a bungalow near Cawnpore, where they seized a lad thirteen years old, precisely in the same manner; death having ensued, they were in the act of ingeniously raising the body over a wall, when the fall of a tile aroused the sleeping parents, who hurried to the spot, from whence the brutes scampered off leaving the victim of their cunning a ghastly spectacle. About this time the wolves in the northern districts became so familiarized with man, by what had happened during the famine, that they very frequently attacked adults and even armed persons. Ordinarily, however, as we have before remarked, the Wolf is a great coward. Sir John Richardson testifies to the same behaviour in the case of the American wolf, which is probably a mere variety of the common grey species. He states that if these wolves were not as fearful as they are rapacious, the American buffalo-hunters would be unable to preserve their game. "The simple precaution of tying a handkerchief to a branch, or of blowing up a bladder, and hanging it so as to wave in the wind, is sufficient to keep herds of wolves at a distance." Sir John Richardson also mentions an instance where a poor Indian woman was killed by a wolf, within sight of her husband, who was coming to rescue her; and it is particularly worthy of notice, that in this instance the neck was the part of the body seized. In the higher northern latitudes many wolves perish during the cold season from inanition; and in some cases, when the winter has been unusually severe and prolonged, they perish by hundreds. Some voyagers tell us that they have both seen and heard the poor animals —for under these circumstances we feel inclined to pity them—howling painfully as they lay stretched and famishing on blocks of ice. To these they have resorted in the hope of catching seals and other marine animals, and while thus employed, the ice-fields have become detached and have drifted away into the open sea. The Wolf, like the fox, forms burrows or earths; into these they retreat during the day, and likewise occupy them for the special purpose of rearing their young. The number of cubs produced at a birth seems liable to vary, there being usually four or five; but in the case of the American variety, Sir John Richardson states that eight or nine are sometimes the result of a single litter. A very effectual manner of extirpating wolves is by smoking them out of their earths. This plan, adopted in India, is extremely simple. All that is necessary, is to be provided with a quantity of sticks, straw, and lucifer matches, and a few pounds of brimstone. There are generally several outlets to each earth; but it is not necessary to make a fire before many of these, especially if the party be well provided with fire-arms. Usually it is not considered desirable to give any of them the slightest chance of escape; but, under any circumstances, it is advisable to fire the lower holes, so as to allow of the fumes being drawn in by a strong current of air. The death of the savage tenant is usually very painful, and long before he comes to the surface, his commencing distress and agony is indicated by a painful moaning. Sometimes they rush out; but being more or less stupified by the fumes, they seldom make their escape. If they avoid the spears and clubs of the natives, who are anxiously watching outside, the gun, rifle, or arrow, more surely effects the purpose of their destruction. In the foregoing remarks we have repeatedly had occasion to point out instances of the cunning and ingenuity of the Wolf; but we cannot entirely quit our account of this animal without quoting another interesting illustration of its craftiness. Mr. Lloyd, in his "Scandinavian Adventures," thus writes:—"At one time, indeed, I had serious thoughts of training a fine female wolf in my possession as a pointer; but I was deterred, owing to the *penchant* she exhibited for the neighbours' pigs. She was chained in a little inclosure, just in front of my window, into which those animals, when the gate happened to be left open, ordinarily found their way. The devices the wolf employed to get them in her power were very amusing. When she saw a pig in the vicinity of her kennel, she, evidently with the purpose of putting him off his guard, would throw herself on her side or back, wag her tail most lovingly, and look innocence personified. And this amiable demeanour would continue until the grunter was beguiled within the length of her tether, when, in the twinkling of an eye, the prey was clutched." Whilst she was young she contented herself with the tail; but after she had realized her full powers, the unsuspecting swine were snapped up bodily, and, on such occasions, Mr. Lloyd found it a difficult matter to rescue them from her jaws.

THE RED WOLF (*Canis jubata*).—This is a well-marked form, inhabiting the marshy districts of South America. The fur has a fine cinnamon-red colour, which imparts to the species a very attractive appearance. The terminal moiety of the tail is white, and there is also a white spot under the head. The Red wolf is further distinguished by a short black mane, commencing at the occiput, and proceeding downwards along the middle line of the back. According to D'Azara, as quoted by Ogilby, these animals "do not commit havoc on the herds or smaller flocks; and as they inhabit only the extensive lowlands and marshes of Paraguay as far as the river Plata, and near its mouth, he has no doubt that they feed on rats, guinea pigs, small birds, and certain vegetables, if these fall in their way, but chiefly on snails, toads, frogs, and other reptiles, and on the land crabs, which are abundant in the plains and sand-banks. They walk with very long paces, run much, and are, D'Azara adds, great plunderers, although they always fly from man, and even from dogs. They are solitary in their habits, are said to swim well, and in their wild state to utter no sound but *gouaa*, which they often and loudly repeat, so as to be heard at a great distance." The Payaguas Indians call the Red wolf *Parœpaga;* it is termed *Culpeu* by the natives of Chili. It is also known as the Aguara, a name likewise applied to a distinct race of wild dogs.

THE DOG (*Canis lupus* var. *familiaris*).—We do not specifically recognize the dog as a distinct animal, and have previously expressed our adhesion to the view that these useful creatures are neither more nor less than domesticated varieties of the common wolf. The natural history of the Dog is a subject of considerable interest; but it is one so extended that the bare enumeration of the leading characteristics and habits of the principal varieties, would require an entire volume for their description and elucidation. Those, therefore, who wish to follow up this department of the subject, must consult works specially devoted to dogs. Some of the numerous canine varieties attain a very great size, with a proportionate degree of strength; such, for example, as the Bloodhound, the Mastiff, the Newfoundland, and the Thibet dog (Plate 6, fig. 23); others are remarkably small, as in certain varieties of Spaniel; while a third kind are extremely attenuated both in shape and make, as instanced by the little Italian Greyhound. In many parts of the world, dogs have returned, at least to a certain extent, to their original wild condition. In this way they have formed several quite distinct races or typical varieties, which are found in different parts of Asia, Australia, and the two Americas. From a general consideration of these forms, it may be fairly stated that, both in structure and appearance, they exhibit a much closer approximation to the common wolf than obtains in the case of any of the varieties which have remained domesticated. (For a full and able exposition of this subject, however, we must refer our readers to Mr. Bell's work on "British Quadrupeds," and particularly, also, to the early part of Dr. Carpenter's admirable article entitled "Varieties of Mankind," contained in the 4th volume of Dr. Todd's "Cyclopedia of Anatomy and Physiology.") The Australian wild dog or Dingo, fig. 30, approaches so closely to the wolf, that it was described by Bewick as the "New South Wales wolf." The Indian Dhole is another interesting example of a return to the wild state. In some respects it comes nearer the jackal. The fur is of a bay or rufous-brown colour; the tail being long and narrow, and not bushy at the extremity. It has a remarkably bright eye, and a keen lively countenance. Though strictly wild and savage, it will not attack persons unless first molested. These Dholes live almost entirely upon other animals, especially deer, which they hunt in large packs; authentic instances are also recorded where they have attacked and overcome tigers. Some have doubted this, but the evidence is complete; and, besides, there can be nothing improbable in the circumstance of wild dogs attacking tigers, when it is a well-known fact that common spaniels will readily do the same thing; many a life, indeed, has been spared by the courage of the latter. When engaged in the chase or on the scent the Dholes do not howl or bark, but, at times of much excitement in the course, they utter a kind of plaintive whining note. Among other kinds of wild dogs which are more or less closely allied to the wolf, we may perhaps class the Caygotte or Coyotl, whose fur has a whitish-brown colour. This animal is an inhabitant of South America, and feeds upon small quadrupeds, and also upon maize and other vegetable matters.

Fig. 30.

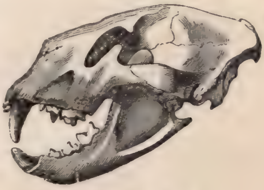


Dingo, The Wild Dog of Australia.

FAMILY VI.—FELIDÆ.

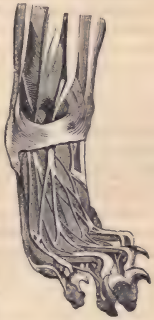
Having in our introductory observations on the Carnivora selected examples of the present family for the purpose of enunciating the leading characteristics of the order—mainly on account of its forming the most typical subdivision of that great mammalian group—the observations which we have now to offer must necessarily assume a supplementary character. In the remarks above alluded to, attention was drawn to the general massiveness of all the osseous elements entering into the solid framework of the typical carnivorous skeleton—this adaptation to the destructive habits of the creature being more particularly conspicuous in the structure of the skull. In the accompanying representation of the cranium of a tiger—fig. 31—the remarkable shortening of the facial bones, associated with the powerful grasping teeth, and a surprising transverse breadth of the skull below the orbital and temporal fossæ, are remarkably significant. The teeth are thirty in number, and of these we find only four true and ten spurious molars, the ultimate grinder on either side of the upper series being tuberculated. This tooth, however, is particularly small, and widened laterally; but, with this exception, all the molars are much compressed from side to side, and the crowns being sharp and pointed, the two series, during the action of the jaws, close in upon each other like the blades of a pair of scissors. Their function is therefore essentially cutting, while that of the huge dagger-like canines, assisted by the incisors, consists in tearing and lacerating—the due performance and integrity of these actions being secured by the strong temporal and nuchal muscles acting upon the occiput and the lower jaw; and farther, to prevent any lateral motion, such as we find in those animals which grind and triturate their food, the condyles or articulating facets of the last-named bone are firmly lodged in the corresponding transversely-elongated glenoid sockets. Co-ordinating with this prehensile and offensive armature of the jaws, we also find the structural modifications of the feet eminently suggestive. Those of the anterior limbs are pentadactylous, while the posterior feet are tetradactylous; but the peculiarities which principally distinguish them arise out of the beautiful provision made for the preservation of their formidable retractile claws. The mechanical contrivances here displayed are perfect. Not only are the actions of flexion, extension, pronation, and supination amply provided for by the peculiar manner in which the bones of the fore limb or arm are articulated together, but the muscles of this member are so prodigiously developed, that, as is well known, a single blow from the sledge-hammer-like paw of a lion or tiger will fracture the skull of a man, and deal death to almost any animal that may happen to come within its ponderous swing. In addition to this, we find the claws ordinarily maintained in a state of retraction; this concealed position is accomplished by the agency of three elastic ligaments or bands, which being severally placed above and on either side of the digit, serve to connect the ultimate phalanx to the penultimate segment of the same toe (fig. 32). All injury to the claw is hereby prevented—a circumstance which, associated with the presence of resilient sole-pads of thickened submucous tissue placed under the ball of the toe, also serves to secure the characteristically graceful and noiseless tread of the feline animal. Antagonistic to the elastic binding cords above mentioned, the tendon or string of a large muscle called the flexor profundus perforans is inserted below, into the base of the ultimate claw-supporting phalanx. When, therefore, it becomes necessary to display or employ these fearful instruments of destruction, a violent contraction of the muscle in question—which of course involves a drawing back of the tendon, and a consequent thrusting forward of the claw—is the principal agency by which this change is effected. There are likewise other small extensor muscles inserted at the upper part of the digit, serving to steady the movement and regulate the degree of protrusion, according to the will of the animal. But, we have further to remark, that, although these constitute the most prominent features in the several structural changes adapted to the wants and habits of the feline mammalia, there are others equally worthy of being mentioned, such as the strong, horny, recurved papillæ of the tongue, formed for rasping the soft flesh from off the bones of their slaughtered victims—the comparatively small salivary glands, showing how little mastication is required—the uninterrupted chain of osseous elements extending from the larynx to the head—the flexibility of the vertebral column—the small cœcum—the shortness of the intestinal canal, and, more particularly, the simple cylindrical stomach, which explains that the food is more readily reduced to the condition required for nutriment, than obtains in the herbivorous quadrupeds. Do not these, and other peculiarities elsewhere noticed, satisfactorily demonstrate that the typical carnivor is intended to occupy the field in the economy of creation for which his powers are so befittingly adapted? Surely one would suppose that the legitimacy of such a self-evident conclusion could not be denied! Are we perverting truth to say, that the lion was not formed to eat straw like an ox? Unfortunately, there

Fig. 31.



Skull of the Tiger.

Fig. 32.



Lion's Foot dissected.

are some so-called educated people who would fain persuade us that we are wrong! It is sad to reflect that some persons can be found who will thus resist the evid nce of their senses, in order to gratify a childish crotchet, or to support a pre-conceived dogma! Those of our readers who have perused the address issued previous to the publication of this part of the "Museum of Natural History," will appreciate the motive which thus leads us to offer a few reflections on the habits of this highly interesting class of animals. Not many years ago the writer of this article had the misfortune to be present at a lecture given in the northern metropolis, by a gentleman whose mind appeared to be singularly ill-adapted for the reception of scientific truth, but whose perverted views, nevertheless, enjoy a certain credence among individuals capable of indulging extreme opinions. Thus, he undertook to inform his audience that the several organs of a carnivorous animal, in which we have been accustomed to recognize teleologic evidences of beauty, harmony, and design, have all been diverted from their proper development by an evil agency—that the claws, teeth, and stomach, which we have just shown to be severally adapted to the seizure, tearing, and digesting of the flesh of other animals, do not, indeed, exhibit evidences of design, benevolence, and wisdom in the Creator, but rather, evidences of another power, which has caused the anterior extremity to become a hideous weapon of destruction—which has caused those teeth to display their tearing and cutting surfaces—which has caused the stomach to assume a vicarious action; all of these organs severally contributing to render the creature ferocious, cruel, and destructive—habits, which, in this anti-zoologist's view, the animal was not intended to have! Such is an illustration of the melancholy inferences to which unscientific dogmatism inevitably leads —a mere bigoted mimicry of mediæval times! For the successful cultivation of natural-history science it is above all things necessary that our minds be imbued with a love of truth, in whatever aspect it may present itself. If we perceive that the integrity of organized existences on this planet can only be maintained by the reciprocal action of antagonistic forces, and that the balance of this reciprocity involves and guarantees the welfare of every living entity, needing a residence on the habitable globe; if, we repeat, it is clearly evident that any departure from this divinely-appointed law would, on the one hand, only bring about a redundancy, or, on the other, a deterioration; what, we ask, is to be gained by impertinently criticising this universal law, this wise method of divine government, fixed on the eternal principles of justice, equity, and compensation? In the nicely-adjusted balance of probabilities we recognize abundant good to all living beings whose immediate wants are thus duly provided for, and we are content to admire and adore the power which regulates the destiny of every species. In conclusion, we have only to observe that the *Felidæ* are widely distributed in all quarters of the world, except in Australia, the larger species being, for the most part, confined to tropical regions.

THE WILD CAT (*Felis Catus*), is more or less abundant throughout the well-wooded and hilly districts of Europe, and was at one time very plentiful in these islands. It is still found in Wales, in the north-west counties of England, and more commonly in Scotland, and certain parts of Ireland. It is not quite two feet long, exclusive of the tail, which measures about twelve inches. The body is stouter than in the common house cat, the tail presenting an almost uniform thickness from one end to the other, except at the tip, where it is slightly swollen. The fur has a yellowish-grey colour generally, but beneath the throat and belly it is nearly white; the sides of the body, the legs, the tail, and summit of the head being striped with brownish-black bands, which becomes lighter as they approach the ventral line. A longitudinal black band runs along the middle of the back, extending from the head to the root of the tail; this last named organ being black at the tip. The wild cat was formerly considered in England a beast of the chase, but, except for mere sport, it does not appear to have been considered of any great value. It is reported, by those who have seen it in its wild haunts, to be extremely ferocious, a circumstance which has doubtless contributed to bring about its almost total extinction. The female produces four or five cubs at a birth, and selects either a hollow tree, a rocky recess, or, according to Sir William Jardine, a large bird's nest, for the protection and rearing of the young.

THE DOMESTIC CAT (*Felis domestica*).—The concurring testimony of the majority of British naturalists favours the notion that our common house cat is a distinct species, or, at least, that it is not a mere domesticated variety of the European wild cat. It is well known that the common cat frequently betakes itself to the woods, and after a time assumes a semi-savage condition. This was at first considered sufficient ground for believing it to be identical with *Felis Catus;* but when, on a closer examination, its characters were not found to have reverted to the state of those ordinarily present in the wild species, considerable doubt arose on the question. The colour of the fur is frequently indistinguishable, but a very marked dissimilarity is seen in the tail, which, instead of being uniformly thick throughout, as obtains in the wild cat, is, in the form under consideration, much narrower and tapering also toward the extremity. Sir William Jardine has made some very interesting remarks on this subject. He says there is probably "no animal that so soon loses its cultivation and returns apparently to a state completely wild. A trifling neglect of proper feeding or attention will often cause them to depend upon their own resources, and the tasting of some wild or living food will tempt them to seek it again, and to leave their civilized home. They then prowl about in the same manner as their congeners, crouching among cover, and carefully concealing themselves from all publicity. They breed in the woods or thickets, and support themselves upon birds or young animals. Few extensive rabbit-warrens want two or three depredators of this kind, where they commit great havoc, particularly among the young in summer. They sleep and repose in the holes, and are often taken in the snares set for their prey." Sir W. Jardine once stumbled upon one of these truants which had just kittened, and by her side there lay two dead leverets! In the ordinary domesticated condition, the cat is certainly of a capricious disposition, but its habits are too well known to demand any lengthened exposition.

THE ÆGYPTIAN CAT (*Felis maniculata*).—The Frankfort naturalist, Rüppell, who discovered this species during his travels in Nubia, has expressed his opinion that our common domestic cat owes its origin to this species. Temminck and others have supported this persuasion, and authorities are still divided on the subject. After weighing the arguments on either side, all that we can say, is, that there appears more probability of our tame animals having descended from the Ægyptian, than from the European wild form; but the matter is by no means settled. In the Ægyptian cat the limbs are more slender, while the tail is narrower and longer than in *Felis Catus*. The fur is greyish-yellow generally; the cheek, throat, under part of the throat, and belly being white. A dark stripe runs along the central line of the back, and the limbs are crossed by several faint blackish bands. The length of the body is about twenty inches, exclusive of the tail, which measures three-quarters of a foot.

THE PAMPAS CAT (*Felis pajeros*).—This species is extensively distributed over the South American plains, from the banks of the La Plata to the Straits of Magellan. It is about the size of the European wild cat, measuring twenty-six inches, exclusive of the tail, which is about a foot from root to tip. The fur is particularly long, the individual hairs being from three to five inches in length; it is of a pale yellowish-grey colour generally, and banded at the sides by numerous irregularly-disposed stripes of a brownish tinge. Along the central line of the back the hairs have a brownish-black colour, which is more or less continued on the tail. The head is comparatively small and rounded, the ears having a moderate development. The tail is short, thick, and rather bushy; but it does not exhibit any circular markings or spots. According to D'Azara, the natives call it *Gato Pajero*, or jungle cat. It is said to feed chiefly upon guinea-pigs.

THE CHATI (*Felis mitis*) is somewhat larger than our common domestic cat, measuring three feet including the tail, for which eleven inches may be reckoned. The fur displays a multitude of irregularly arranged dark-brown patches on a general ground colour of pale yellow above, and white below; on the limbs these spots are more rounded, and there are two crescent-shaped collar-like bands beneath the throat. The ears are blackish externally; the pupil of the eye is rounded. The tail is slightly ringed towards the tip. Like the foregoing, the Chati is an inhabitant of the plains of South America. The female preserved in the Parisian menagerie, was extremely gentle and fond of attention.

THE CHIBIGUAZU (*Felis chibiguazu*) is also a South American animal, being rather larger than the above, and measuring, according to D'Azara, four feet including the tail, which is about thirteen inches long. Some regard it as identical with the chati, others refer it to the ocelot; probably it is distinct. It is exceedingly cunning and destructive in its habits; approaching and entering human habitations only in the darkest nights, and then, not content with carrying off as much poultry as it can manage, it destroys others that have been left behind. If taken young it becomes very tractable and amusing, but if allowed much liberty it soon displays its fowl-destroying propensities.

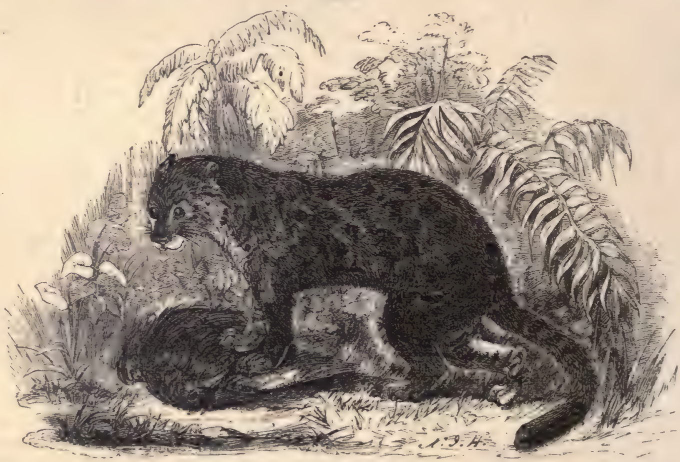
THE SERVAL (*Felis serval*) is a native of southern Africa, and is called the *Tiger boschkatti* by the Dutch colonists at the Cape. By others it is called the leopard. According to Mr. Andersson some of the African tribes believe the real tiger to exist in that country, but it is evident that they refer to the serval. This animal is remarkably savage. "One night," says Mr. Andersson, "I was suddenly awoke by a furious barking of our dogs, accompanied by cries of distress. Suspecting that some beast of prey had seized upon one of them, I leaped, undressed, out of my bed, and, gun in hand, hurried to the spot whence the cries proceeded. The night was pitchy dark, however, and I could distinguish nothing; yet, in the hope of frightening the intruder away, I shouted at the top of my voice. In a few moments a torch was lighted, and we then discovered the tracks of a leopard, and also large patches of blood. On counting the dogs, I found that 'Summer,' the best and fleetest of our kennel, was missing. As it was in vain that I called and searched for him, I concluded that the tiger had carried him away; and, as nothing further could be done that night, I again retired to rest, but the fate of the poor animal continued to haunt me, and drove sleep away. I had seated myself on the front chest of the waggon, when suddenly the melancholy cries were repeated; and, on reaching the spot, I discovered 'Summer' stretched at full length in the middle of a bush. Though the poor creature had several deep wounds about his throat and chest, he at once recognized me, and, wagging his tail, looked wistfully in my face. The sight sickened me as I carried him into the house, where, in time, however, he recovered." It is also satisfactory to learn that the savage animal was found on the day succeeding the encounter. On being discovered the beast took refuge in a tree, and was not dispatched before it had received sixteen wounds, some of the arrows employed for this purpose having been poisoned. In Dr. Gray's arrangement of the Felidæ contained in the British Museum, this species is denominated *Leopardus serval*.

THE NEPAULESE CAT (*Felis Nepaulensis*).—In the list of feline mammalia preserved in our National Museum, this species is called the waved cat or *Felis inconspicuus*, and it is believed by Dr. Gray to be identical with the Bengal cat. Dr. Horsfield considers these forms to be distinct. The body is scarcely two feet long, exclusive of the tail, for which another ten or eleven inches must be allowed. The general colour of the fur is that of a tawny-grey, the surface being marked with spots and linear patches of a deep-black colour, somewhat irregularly disposed. The throat and under part of the belly are whitish; the spots on the tail being uniform, rounded, and arranged so as to resemble transverse bands.

THE KUWUK (*Felis Javanensis*) is also a small species, principally distinguished by its comparatively short tail and rather long legs; it is also only provided with three molars on either side of each jaw. The body is twenty-three inches in length, not including the tail, which measures between eight and nine inches. The fur has a greyish-brown colour generally, the under part of the throat, neck, and belly being nearly white; it is long, and of a softish texture. Four dark brownish-black bands pass from the crown of the head to the root of the tail, while the sides of the body are marked by sparsely-scattered oblong patches of a similar colour; having a tendency to assume a linear arrangement. Similar spots occur on the limbs and tail. The eyes are placed well forward, and have a circular pupil. The ears are small and rounded. According to Dr. Horsfield the "Kuwuk is found in large forests in every part of Java. It forms a retreat in hollow trees, where it remains during the day; at night it ranges about in quest of food, and often visits the villages at the skirts of the forests, committing depredations among the hen-roosts. The natives ascribe to it an uncommon sagacity, asserting that in order to approach the fowls unsuspected, and to surprise them, it imitates their voice. It feeds chiefly on fowls, birds, and small quadrupeds; but, in case of necessity, it also devours carrion." It is, we are further informed, a very fierce and untameable animal. In the British Museum list of preserved specimens, it is designated *Leopardus Javanensis.*

THE BULU (*Felis Sumatrana*).—As far as regards size, the comparative shortness of the tail, the length of the limbs, and in the disposition of its spotted markings, this species very closely resembles the foregoing. According to Horsfield, the general ground colour of the fur "is ferruginous, inclining to yellowish-grey, more intense on the back, the crown of the head, and the upper part of the tail; paler on the sides, and passing into whitish-grey on the cheeks, breast, abdomen, and the interior of the thighs and legs." The Bulu (fig. 33) is an inhabitant of Sumatra, Java, and the contiguous islands. In the list of specimens preserved in our National Museum, it is also associated with the leopards.

Fig. 33.



The Bulu (Felis Sumatrana).

THE OCELOT (*Felis pardalis*) inhabits the forests of tropical America, and is an attractive-looking species. The body is about three feet in length, exclusive of the tail, which measures from twelve to fourteen inches. The general colour of the fur is fulvous-grey, the inferior parts of the throat, neck, and belly being nearly white. The entire surface is beautifully streaked with irregularly shaped patches of a black colour; these spots having a marked tendency to form longitudinal bands, especially at the upper part of the body. The ears are small and rounded, the limbs comparatively short. Respecting its habits, the Ocelot is a good climber, and is said to sham a state of death in order to capture monkeys, whose curiosity leads them to approach and inspect the simulating carcass. It is capable of being tamed, but, like others of the cat tribe, its disposition is capricious. Mr. Blyth mentions an instance where "a gentleman had succeeded in taming an ocelot, which for three years, enjoyed the range of his house and garden as freely as a domestic cat, appearing thoroughly reclaimed. One evening, however, at the fireside, when a child of three years old was playing with it, as it had often done before, the animal being irritated, seized the infant by the throat, and killed it before assistance could be rendered." In the British Museum's list, this animal is classed with the leopards.

THE CHAUS (*Felis Chaus*) is a kind of Lynx. It has a wide geographical distribution, inhabiting Egypt, Persia, the borders of the Caspian, and also many parts of central and northern India. It is chiefly found in low marshy grounds and jungles, where it preys upon small quadrupeds and birds, and also, according to Rüppell, on fishes. The fur is comparatively long, loose, soft, and of a yellowish-grey colour. The tail is short, thick, and indistinctly marked by four or five alternating black and greyish-white bands. These occur towards the extremity, which terminates somewhat abruptly. In common with other allied forms, the ears are much pointed, being tufted at the summit by a pencil of fine black hairs, half an inch in length. The Chaus is not very easily tamed. The Booted lynx—*Felis caligata* of Olivier—appears to be identical with it. In the catalogue of specimens preserved in the British Museum it is designated *Chaus Lybicus*.

THE EUROPEAN LYNX (*Felis Lynx*).—There are several forms of Lynx, regarded by some as so many distinct species, which are only varieties of this type. Among these may be mentioned the *Felis virgata* of Nilsson; the *F. cervaria* of Temminck, being an Asiatic form; and perhaps also the *F. pardina* of Oken, found in Spain and southern Europe. The European lynx is about three feet long, not including the short tail, which measures six inches. The fur is long, rough, and of a rufous-grey colour above, the under parts of the throat and belly being more or less white. The sides are indistinctly marked with oblong spots, and the free end of the tail is tipped with black. The ears are hairy, and pencilled at the upper part; the limbs stout, and comparatively short. During the winter season the general colour of the fur is much lighter than in summer, while it is also considerably longer. The European lynx is a good climber, feeding principally on small mammalia and birds.

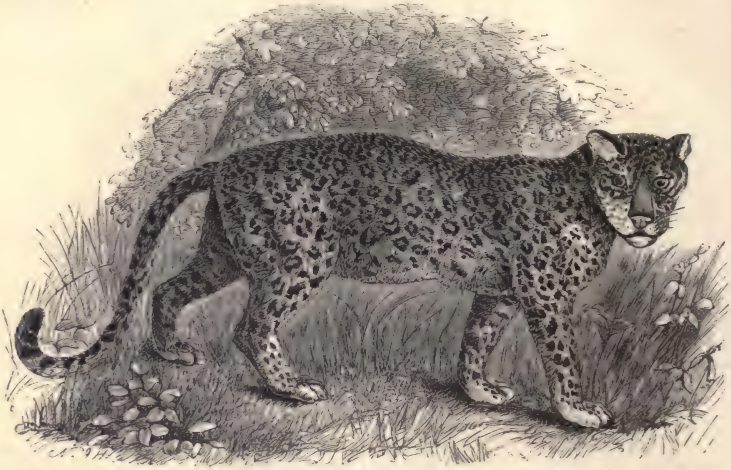
THE CANADA LYNX (*Felis Canadensis*) was formerly supposed to be only a variety of the above, but it is now generally believed to be distinct. In respect of size, colouring, and other characters of the fur, it very closely resembles the European species. The body is rather more than three feet in length, exclusive of the tail, which measures only four and a half inches. For an accurate account of this animal's habits we are indebted to Sir John Richardson, who remarks that "it is a timid creature, incapable of attacking any of the larger quadrupeds; but well armed for the capture of the American hare, on which it chiefly preys. Its large paws, slender loins, and long but thick hind legs, with large buttocks, scarcely relieved by a short thick tail, give it an awkward, clumsy appearance. It makes a poor fight when it is surprised by a hunter in a tree; for though it spits like a cat, and sets its hair up, it is easily destroyed by a blow on the back with a slender stick, and it never attacks a man. Its gait is by bounds, straightforward, with the back a little arched, and lighting on all the feet at once. It swims well, and will cross the arm of a lake two miles wide; but it is not swift on land. It breeds once a year, and has two young at a time." We are further informed that the natives eat its flesh, and that from seven to nine thousand skins are annually exported by the Hudson's Bay Company. In Dr. Gray's catalogue this species is designated *Lyncus Canadensis*.

THE CARACAL (*Felis Caracal*) is also a kind of lynx, having a wide geographical range, and extending not only over Africa, but, according to Mr. Bennett and others, over southern Asia, as far eastward as the Ganges. The body is about thirty-four inches in length, excluding the tail, which measures other nine inches. The fur exhibits a uniform rufous-brown colour generally, growing paler from above downwards, and becoming white immediately underneath the throat, neck, and belly. On each half of the face are placed two pure white spots, one being situated above and to the inside of the eye, the other occurring beneath the outer angle of this organ. The ears are comparatively long, "tapering gradually to a fine tip, surmounted by a pencil of long black hairs," which are dark externally, and whitish within. Like other species of lynx, the Caracal is a good climber, and feeds chiefly on small mammalia and birds. It is said also to feed on the carcasses of larger quadrupeds, which have been forsaken by lions. The Caracal is proportionably strong, savage, and only tamed with difficulty. According to Mr. Andersson, the fur is much esteemed by the natives of southern Africa for making carosses, &c., while the Dutch settlers employ it as a local application in rheumatism. In Dr. Gray's list this species is termed *Caracal melanotis*.

THE OUNCE (*Felis Uncia*).—Since the naturalist Buffon gave an accurate description of this animal, some authorities have disputed its claims to be regarded as a separate species. It is, however, quite distinct, and in the language of Dr. Gray, "easily known by the thickness of its fur, the paleness of its colour, the irregular form of the spots, and especially by the great length and thickness of the tail." In the form of this last-named organ, we observe a wide departure from the peculiarly short stumpy condition of the tail in the lynxes; justifying perhaps, when taken into consideration with other minor characters, their generic separation—a view which several naturalists have practically adopted. The Ounce is about the size of the common leopard, and has similar habits. It is a native of the mountainous districts of central Asia. In the list of feline mammals presented in our national collection, it is denominated *Leopardus Uncia*.

THE LEOPARD (*Felis Leopardus*).—Most naturalists have arrived at the conclusion, that the Leopard and Panther are one and the same animal; we say arrived, but it would be more just to state, that they have finally acknowledged the opinion of Linnæus on this point to be correct, after having over and over again disputed his authority. The Leopard is truly a beautiful species (fig. 34). The ground colour of the fur has a pale yellow tint, the surface being marked at tolerably regular intervals by dark patches made up of numerous small round spots, blended together in the form of annulations surrounding a central clear space, the general tint within being deeper than the ground colour without. The Leopard is widely distributed in Africa, Asia, and the Indian Archipelago. Its habits are essentially cat-like, and, being an expert climber, the Indian natives call it the Tree-tiger or *Lackree bang*. Unlike the tiger, it is said that nothing will induce it to take to the water. Leopards are remarkably deceitful, shy, and ravenous, the utmost caution being necessary in any attempt to domesticate them. Their treacherous disposition has been illustrated in various ways, especially by Captain Williamson, who, amongst other things, relates the following incident:—"The adjutant of our regiment, wishing to send a leopard as a present to a friend in England, procured a very fine cub, which had scarcely opened its eyes, and took every pains to rear it in such a manner as might obviate all apprehension. For some months the animal appeared as innocent as a kitten, was playful, and seemed to be peculiarly tractable. I will not say how far its disposition might have continued unexceptionable under any other circumstances, but, unhappily, several of the privates of the artillery having access to the place where the leopard was kept, and of course now and then imprudently worrying him, the leopard became snappish and petulant. One day a soldier provoked him rather too far, when the leopard, now grown to the size of a stout pointer, suddenly reared, and fixing his claw in the nape of the man's neck, tore his shoulder in such a manner as to occasion the soldier's death in the course of a few hours. The leopard from that time became so ferocious as to render it absolutely necessary to shoot him—a measure which gave universal satisfaction."

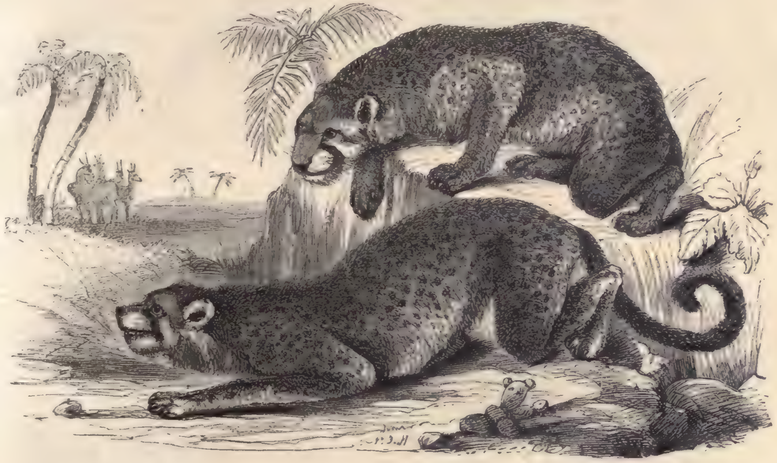
Fig. 34.



The Leopard (Felis Leopardus).

THE CHEETAH (*Felis jubata*).—This is a species of very great importance in a zoological point of view, inasmuch as it has been represented as forming an aberrant transitional type between the dogs and cats; and but for the marked disparity in size, its general appearance, and the noble lion-like attitude which it assumes, we might perhaps have more reasonably considered it at the beginning of the feline series. Much has been written concerning its true zoological position, especially by Mr. Bennett, who is quite eloquent upon the subject; yet Professor Owen's detailed researches into the anatomy of this animal, clearly demonstrate that the so-called canine characters are more apparent than real. The body is much elongated, and stands high on the legs, which are correspondingly slim (fig. 35). The fur has a pale fulvous colour generally, being almost white beneath the neck and belly; and except in these situations, the entire surface is marked with numerous uniform and closely-set spots of a deep-black colour. The tail is long, and somewhat bushy at the tip, the central line beneath it, and the extremity, being white; but at the upper part and sides throughout the remainder of its extent, it is more or less annulated, the spots having a tendency to form incomplete transverse rings, which become more and more conspicuous as they approach the free extremity. The mane is very slightly developed; the ears are short and rounded; the pupil of the eye is circular; the tip of the nose being black. The feet are provided with retractile claws, as in other Felidæ; but, according to Professor Owen, their action is somewhat restricted on account of the length of the unequal phalanges and their elastic ligaments. Some authors have erroneously stated that the claws are non-retractile. The Cheetah enjoys a wide geographical range over the open grounds of Africa and southern Asia. It is a singularly graceful and elegant species, and is very commonly known by the name of the Hunting leopard. In Persia it is called the *Youze*, and Mr. Ogilby tells us that "in the East, where these beautiful animals are employed in the chase, they are carried to the field in low cars, whereon they are chained. Each leopard is hooded. When the hunters come within view of a herd of antelópes, the leopard is unchained, his hood is removed, and the game is pointed out to him; for he is directed in the pursuit by his sight. Then he steals along cautiously and crouchingly, taking advantage of every means of masking his attack, till he has approached the herd unseen within killing distance, when he suddenly launches himself upon his quarry with five or six vigorous and rapid bounds, strangles it instantaneously, and drinks its blood. The huntsman now approaches the leopard, caresses him, wins him from his prey by placing the blood which he collects in a wooden ladle under the nose of the animal, or by throwing to him pieces of meat; and whilst he is thus kept quiet hoods him, leads him back to his car, and there chains him. If the leopard fails, in consequence of the herd having taken timely alarm, he attempts no pursuit, but returns to his car with a dejected and mortified air." The Cheetah seems, therefore, quite capable of domestication. It exhibits a frankness of look, and an openness of manner, totally different from the sneaking distrustfulness of ordinary cats. Any one who has carefully watched the behaviour of the two beautiful specimens at present contained in the Zoological Society's Gardens, Regent's Park, cannot but have been struck with their playful freedom, gentle manners, and elegant attitudes; their habits entirely according with the favourable account given by Mr. Bennett of a similar pair formerly preserved in the Tower menagerie. In Dr. Gray's list this species is designated *Gueparda jubata*.

Fig. 35.

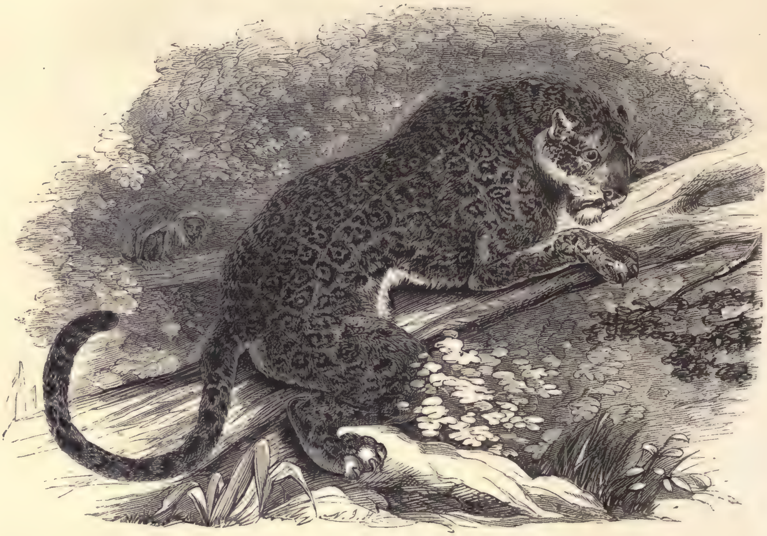


The Cheetah or Hunting Leopard (Felis jubata).

THE JAGUAR (*Felis Onca*) is a broad-chested, powerfully-built animal, inhabiting Central and South America (fig. 36). By some it is called the "great panther" or leopard. The body occasionally measures nearly five feet, exclusive of the tail. The fur is beautifully spotted, with annulations resembling those of the common leopard, their general appearance being, in the language of Mr. Bennett, at first sight "the same in both; but the open roses of the leopard are scarcely more than half the size of those of the jaguar, and they all inclose a space of one uniform colour, in which, unless in some rare and accidental instances, no central spots exist; while in the latter animal most of those which are arranged along the upper surface, near the middle line of the back, are distinguished by one or two small black spots inclosed within their circuit. The middle line itself is occupied in the leopard by open roses, intermixed with a few black spots of small size and roundish form; that of the jaguar, on the contrary, is marked by one or two regular longitudinal lines of broad, elongated, deep black patches, sometimes extending several inches in length, and occasionally forming an almost continuous band from between the shoulders to the tail. The black rings towards the tip of the latter are also more completely circular than in the leopard." Respecting the habits of the Jaguar, its ferocious and destructive character is well known; devouring, as it does, with equal avidity, all kinds of cattle, horses, and other quadrupeds, monkeys, birds, fishes, and even reptiles, having, it is said, a true aldermanic relish for savoury turtle. Notwithstanding its fierceness, it is a cowardly animal, instances having been recorded where a loud shout has been sufficient to scare it away. The Spanish naturalist, D'Azara, gives an apt illustration of its great strength:—"A jaguar had struck down a horse, and D'Azara gave instructions that the latter should be drawn within musket shot of a tree wherein he intended to pass the night, in expectation that the jaguar would return for his prey. While D'Azara was gone to prepare himself, the jaguar returned from the opposite side of a broad and deep river, seized the horse in its mouth, drew it to the water some sixty paces, swam across the river with it, and drew it into a wood hard by." Both in form and colouring the Jaguar is prone to considerable variation, one of the kinds being of a deep brownish-black hue generally, so that the dark spots are scarcely rendered visible.

THE RIMAU-DYAN (*Felis macroscelis*) or Gigantic Tiger-cat of Sumatra, is a magnificent animal, and one of the handsomest of all the feline mammalia. The body is about three and a half feet long, exclusive of the tail, which would give us some three feet more The fur has a brownish-grey colour, and is marked with marbled, interrupted, and angular patches of a deep velvet-black colour. In the 1st volume of the *Zoological Journal*, Sir Stamford Raffles gives the following account of the habits of two half-tamed examples:—"Both specimens, while in a state of confinement, were remarkable for their good temper and playfulness; no domestic kitten could be more so; they were always courting intercourse with persons passing by, and in the expression of their countenance, which was always open and smiling, showed the greatest delight when noticed, throwing themselves on their backs, and delighting in being tickled and rubbed. On board the ship there was a small music dog, who used to play round the cage with the animal, and it was amusing to observe the playfulness and tenderness with which the latter came in contact with his inferior-sized companion. When fed with a fowl that died, he seized the prey, and after sucking the blood and tearing it a little, he amused himself for hours in throwing it about, and jumping after it in the manner that a cat plays with a mouse before it is quite dead. He never seemed to look on man or children as prey, but as companions; and the natives assert that when wild, they live principally on poultry, birds, and the smaller kinds of deer. They are not found in numbers, and may be considered rather rare animals, even in the southern part of Sumatra. Both specimens were procured from the interior of Bencoolen, on the banks of the river of that name. They are generally found in the vicinity of villages, and are not dreaded by the natives, except as far as they may destroy the poultry. The natives assert that they sleep and often lay wait for their prey on trees; and from this circumstance they derive the name of *Dahan*, which signifies the fork formed by the branch of a tree, across which they are said to rest and occasionally stretch themselves." The Rimau-dyan is identical with, and also known by the name of, the Clouded tiger. A fine living example exists in the Zoological Society's collection, Regent's Park.

Fig 36.



The Jaguar (Felis Onca).

THE TIGER (*Felis Tigris*)—Plate 8, fig. 29—is readily distinguished from all other feline mammalia by its large bulk, associated with the characteristic transverse bands which occupy all parts of the body. The stripes form rings on the tail, the tip being always black. On the inside of the limbs and under part of the belly the fur is white. In some examples there is more splitting of the bands than in others, forming what are termed the double stripes. In all the tigers we have seen, this tendency was more or less marked. In the specimen called "Jungla," now exhibiting in this country, and formerly the property of the king of Oude, this variation is remarkably developed; but in other respects the much vaunted "fighting tiger" is not to be compared with the examples preserved in the Zoological Society's Gardens, Regent's Park. The Tiger is not furnished with a mane, and he stands less erect than the lion; his entire shape and make being more slender and graceful than that of his noble-looking congener. In regard to its geographical distribution, it is almost entirely confined to the great Indian peninsula and its adjacent islands, although it is also found in central and eastern Asia—in the latter region as far as Chinese Tartary. Early writers have celebrated in strong terms the ferocious and amazingly destructive habits of this animal; while its enormous strength, prodigious speed, and tremendous leaping powers, have over and over again been only too faithfully illustrated by the disastrous records of its ravages, which have ever and anon appeared on the page of history. Cruel, insidious, bloodthirsty, and malevolent—such is the character it bears; but there are some who would fain modify the force of this charge, and defend the character, if not protect the life, of this fearful scourge of man and beast. The tiger is certainly a very cowardly animal, although the naturalist Pennant has been sadly taken to task for having recorded and believed the fact, that one of these beasts had been frightened by the mere unfolding of an umbrella. Whilst a party of ladies and gentlemen were seated under the shade of some trees on the banks of a river in Bengal, they observed a tiger preparing to spring; "one of the ladies, with amazing presence of mind, laid hold of an umbrella, and furled it full in the animal's face, which instantly retired, and gave the company an opportunity of removing from so terrible a neighbour." Such is Pennant's account, and although rather badly expressed, there can be no just reason for doubting its truthfulness. Confirmatory of this story, we have recently, through the columns of the *Times*, been made acquainted with the circumstance and results of a frightful attack, where a light umbrella proved, for the time at least, a most valuable instrument of defence. An English person, whose letter dates from Penang, February 10, 1859, writes:—"My escape from the tiger was truly miraculous, but that of Padre Cuellon was still more so, as the following details of the attack upon that worthy priest will clearly prove. The padre was on his way to church, and was immersed in the study of his sermon, when a tiger, to his utter surprise, suddenly rushed out of the jungle or tall grass; but as the beast had not measured its distance to a nicety, the padre, walking very quickly, was more frightened than hurt. The tiger, however, brushed so close to him, that his trowsers were torn, the snap of the beast being almost within a hair's-breadth of his leg. The brute, not contented with a single spring, made another charge upon the poor padre, and as he had nothing wherewith to defend himself but his large paper umbrella, he suddenly opened it out in the animal's face, which had the effect of cowing it for a time. The tiger, however, evidently gamer or more pertinacious in his attacks than is wont with his tribe, charged the padre at least a dozen times, which occupied nearly twenty minutes. In the meantime the padre gradually edged towards a tree in an open space of ground, and as there was a large white ant's nest between him and the tiger, round which the latter had to make, this enabled the padre to climb the tree and get out of his way. The tiger, on getting round the nest, was at first puzzled at not seeing his intended victim; but in a few minutes he had his nose to the ground, and so scented the whereabouts of the padre. The tiger quietly sat down under the tree, and gave a wistful look upwards, but it was of no avail. The natives at length hearing the cries of the worthy padre, hastened to the spot, and rendered the assistance required. The tiger fled the instant it heard their shouts. The poor priest burst into tears, and sang the 'Te Deum,' in token of gratitude for his delivery. Padre Cuellon, however, did not rally long; the fright had too serious an effect upon his system, and in about ten days he sank to rise no more." We might furnish many other proofs of the cowardly conduct of the tiger. Captain Thomas Williamson—no mean authority, and no mere closet naturalist—deliberately gives it as his opinion, that the tiger is more of a coward than any other beast of prey; "its treacherous nature induces it, almost without exception, to conceal itself until its prey may arrive within reach of its spring—be its victim either bulky or diminutive. Size seems to occasion no deviation in the tiger's system of attack, which is founded on the art of surprising. We find, accordingly, that such as happen to keep the opposite side of a road by which they are somewhat beyond the first spring, often escape injury; the tiger being unwilling to be seen before he is felt. Hence it is rarely that a tiger pursues; but, if the situation permit, his cunning will not fail to effect his purpose; he will steal along the road's side among the bushes parallel with the traveller's course, until one of the many chances which present themselves, of finding him within reach, induces to the attack. Often where the country is rather too open to allow his proceeding in this manner, the tiger will take a sweep among underwood or through ravines, in order to meet the traveller again, at a spot whence he may take his spring. Tigers are extremely partial to such sites as command a road, selecting one rather less frequented, in preference to one that is much in use. In the former they are certain of finding as much as will answer their daily wants." On one occasion, observes the same author, "I was travelling past in my palankeen, through the Ramghur district, which is mountainous and little cultivated, being for the most part in a state of nature and everywhere abounding in jungles, when a *bangy-wollah*, who conveyed two baskets of linen and refreshments, and who preceded the palankeen about an hundred and fifty yards, set down his load and seated himself on the side of the road to rest awhile. About two yards behind him was a small bush, not much larger than a good-sized currant tree, round which a small quantity of jungle grass was growing to the height of about three feet. There was not another twig to be seen for at least half a mile on that side of the road. No sooner had the poor fellow seated himself, than a tiger sprang from behind, or rather from within the bush, and, after giving the fatal blow with his paw, seized the man by the shoulder, and dragged him off with the utmost ease at a round pace, into a thick cover which had as formerly skirted the road, but which had by order of government been cut away to the distance of about a hundred yards, for the safety of travellers." Some such deceitful plan is, in point of fact, the ordinary method adopted by the tiger for overcoming its prey. The melancholy death of Sir Hector Munro's son took place in a similar manner. Several writers have recorded the incident, which, according to Mr. Wood, took place under the following circumstances:—"This unfortunate gentleman, accompanied by three of his friends, went on shore, December 22, 1792, on Sawgar Island, to shoot deer. They continued their sport till the afternoon, when they retired to the edge of a jungle to refresh themselves, where they had not remained long before one of the party, who was leaving the rest to shoot a deer, heard a dreadful roar, and saw a large tiger spring on poor Munro, and rush with him into the jungle with the greatest ease, dragging him through everything that obstructed his course, as if all were made to yield to his amazing strength. All that his companions could do to rescue their friend from this shocking situation, was to fire at the tiger; and it is evident that their shots took effect, since in a few minutes after, Mr. Munro staggered up to them and fell. Every medical assistance that the ship afforded was procured for him immediately, but in vain; he expired in the course of twenty-four hours, in the greatest agonies. His head was torn, his skull fractured, and his neck and shoulders covered with wounds made by the claws of the savage beast. It is worthy of observation, that neither the large fire that was blazing close to them, nor the noise and laughter which, it seems, they were making at the time, could divert this determined animal from his purpose." This, however, is no proof of the tiger's bravery, since it fell upon them unawares, and their noise was that of unsuspicious mirth, and not of the kind to scare away such a cowardly enemy, but rather to attract him. Tiger-hunting in India is considered the noblest and most dangerous of sports; and from the mass of interesting details which have appeared in various works devoted to the subject, it is difficult to decide which are the most meritorious records of the chase. Captain Mundy tells us of a hunting party who sprung a tiger, when the following scene ensued:—This beast "took to the open country, which would have more become a fox than a tiger, who is expected by his pursuers to fight, and not to run; and as he was flushed on the flank of the line, only one bullet was fired at him ere he cleared the thick grass. He was unhurt, and we pursued him at full speed. Twice he threw us out by stopping short in small strips of jungle, and then heading back after we had passed; and he had given us a very fast trot of about two miles, when Colonel Arnold, who led the field, at last reached him by a capital shot, his elephant being in full career. As soon as he felt himself wounded, the tiger crept into a close thicket of trees and bushes, and crouched. The two leading sportsmen overran the spot where he lay, and as I came up I saw him through an aperture rising to attempt a charge. My *mahout* had just before, in the heat of the chase, dropped his ankors, or goad, which I had refused to allow him to recover; and the elephant being notoriously savage, and further irritated by the goading he had undergone, became consequently unmanageable; he appeared to see the tiger as soon as myself, and I had only time to fire one shot, when he suddenly rushed with the greatest fury into the thicket, and falling upon his knees, nailed the tiger with his tusks to the ground. Such was the violence of the shock, that my servant, who sat behind, was thrown out, and one of my guns went overboard. The struggles of my elephant to crush his still resisting foe, who had fixed one paw on his eye, were so energetic, that I was obliged to hold on with all my strength to keep myself in the houdah. The second barrel, too, of the gun, which I still retained in my hand, went off in the scuffle, the ball passing close to the mahout's ear, whose situation, poor fellow, was anything but enviable. As soon as my elephant was prevailed upon to leave the killing part of the business to the sportsmen, they gave the roughly-used tiger the coup-de-grace." Sometimes, when the elephant rushes upon the tiger in the manner just mentioned, it is absolutely impossible for the riders to keep their seats. The author of the "Oriental Field Sports" gives an amusing illustration of an accident of this kind which happened to Captain John Rotton:—"He was one of a very numerous party assembled for the purpose of tiger-hunting, and was mounted on a very fine male elephant, that, far from being timid, was very remarkable for a courage scarcely to be kept within the bounds of prudence. This singularly fine animal having, after much beating a thick grass, hit upon the tiger's situation, uttered his roar of vengeance, which roused the lurking animal, occasioning him to rise so as to be seen distinctly. No sooner did the tiger show himself, than Captain Rotton, with great readiness, bending his body a little to the left, took aim at him as he stood up, crosswise, almost close to the elephant's head. The elephant no sooner espied his enemy, than he knelt down, as is common on such occasions, with the view to strike the tiger through with his tusks. At the same time the tiger, sensible of the device, as suddenly threw himself on his back, thereby evading the intended mischief, and ready to claw the elephant's face with all four feet, which were thus turned upwards. Now, whether Captain Rotton had not been in the habit of joining in such rapid evolutions, or that the elephant forgot to warn him to hold fast, we know not; but, so it happened, that the delicate situation in which he was placed, while taking his aim, added to the quickness of the elephant's change of height forward, combined to project him, without the least obstruction, from his seat, landing him plump on the tiger's belly! This was a species of warfare to which all parties were apparently strangers. The elephant, however fearless in other respects, was remarkably alarmed at the strange round mass—the captain being remarkably fat—which had shot like a sack over his shoulder; while the tiger, judging it to be very ungentlemanly-like usage, lost no time in regaining his legs, trotting off at a round pace, and abandoning the field to the victorious captain!" With regard to other modes of destroying tigers, it may be observed generally that these animals are not very easily secured by traps. According to Williamson, they adopt a very ingenious method in Persia. "This device consists of a large semi-spherical cage, made of strong bamboos or other efficient materials, woven together, but leaving intervals throughout of about three or four inches broad. Under this cover, which is fastened to the ground by means of pickets, in some places where tigers abound, a man, provided with two or three short strong spears, takes post at night. Being accompanied by a dog, which gives the alarm, or by a goat, which by its agitation answers the same purpose, the adventurer wraps himself up in his quilt, and very composedly goes to sleep, in full confidence of his safety. When a tiger comes, and, perhaps after smelling all around, begins to rear against the cage, the man stabs him with one of the spears through the interstices of the wicker-work, and rarely fails of destroying the tiger, which is ordinarily found dead at no great distance in the morning." Another plan, stated by the same authority to be employed in Oude, is too amusing to pass unnoticed:—" The track of a tiger being ascertained, which, though not invariably the same, may yet be known sufficiently for the purpose, the peasants collect a quantity of the leaves of the prauss, which are like those of the sycamore, and are common in most underwoods, as they form the larger portion of most jungles in the north of India. These leaves are smeared with a species of bird-lime, made by bruising the berries of an indigenous tree; they are then strewed with the gluten uppermost, near to that opaque spot to which, it is understood, the tiger usually resorts during the noon-tide heats. If by chance the animal should tread on one of the smeared leaves, his fate may be considered as decided. He commences by shaking his paw, with the view to remove the adhesive incumbrance; but finding no relief from that expedient, he rubs the nuisance against his face with the same intention, by which means his eyes, ears, &c., become agglutinated, and occasion such uneasiness as causes him to roll, perhaps among many more of the smeared leaves, till at length he becomes completely enveloped, and is deprived of sight. In this situation he may be compared to a man who has been tarred and feathered. The anxiety produced by this strange and novel predicament soon discovers itself in dreadful howlings, which serve to call the watchful peasants, who, in this state, find no difficulty in shooting the mottled object of detestation." A more common method of destroying tigers is that of shooting them from a moychaun or platform. This temporary elevation is erected only when a tiger has carried off some animal, and the haunt of his concealment has been duly ascertained by finding the half-mangled carcase. The platform is then rapidly constructed of bamboo or other poles, and raised about twenty feet from the ground. On the tiger's return, the native shecarrie, or sportsman, seldom fails to kill or mortally wound the beast, for which, on his return home, he is amply rewarded by money, gifts, and congratulations. In conclusion, we may remark that the tiger is capable of being tamed, but its disposition is irascible and uncertain. The female usually produces from two to four cubs at a birth.

THE PUMA (*Felis concolor*), Cougar, or American lion, as it is erroneously called, is easily recognized by its nearly uniform fawn-coloured fur, which in the young state, however, is faintly marked at the sides with spots of a rather deep tinge of the same hue. The inner sides of the legs, as well as the under parts of the throat and belly, are lighter, inclining to white; but the posterior aspect of the ears, especially at the base, the sides of the muzzle, and the tip of the tail, are black. The body is about four feet six inches, not including the tail, which measures some six and twenty inches. With regard to its habits, early writers have represented the Puma to be an extremely savage species. This is indeed quite true, in so far as it relates to its depredations among cattle; but it has seldom been known to attack any human being. Mr. Lawson, in his " History of Carolina," states that his prey consists of " swine's flesh, deer, or anything he can take. No creature is so nice and clean as this in his food. When he has got his prey, he fills his belly with the slaughter, and carefully lays up the remainder, covering it very neatly with leaves, which, if anything touches, he never eats any more of it." The Puma is an excellent climber; but, as a rule, it appears to prefer the low, swampy, and more open grounds, where it may commit terrible havoc among herds of cattle pasturing in these situations. It has been known to destroy as many as fifty sheep in a single night. The Puma formerly occupied an extensive geographical range, extending from Canada to Patagonia; but the progress of civilization has made terrible inroads upon its haunts, it being now confined to limited areas chiefly in the prairies of the north and the marshy lowlands of the south. In the Pampas it is hunted and taken with the lasso, while in Canada and the States it falls to the more surely destructive rifle. When taken young the Puma is easily tamed, and in the domesticated state, exhibits all the playfulness of a kitten; while on being caressed it utters the characteristic purring sound. In the British Museum's list of Felidæ it is associated with the leopards.

TRAILL'S PUMA (*Felis unicolor*), or Spotless cat, appears to be quite distinct, being little more than half the size of the true Puma. The body measures thirty-two inches, exclusive of the tail, which would give us another twenty inches. " The general hue of this species is a beautiful glossy reddish-brown. The colour of the whole upper part of the body, including the head and tail, has a considerable resemblance to that of a dark bay horse. The tint becomes gradually paler on the sides and under part of the neck, and passes by imperceptible shades into an ochry brown on the belly. When closely examined, the darker colour of the back is partly owing to an intermixture of blackish-brown hairs with the rest of the fur. The hair over the body is rather short, like that usually seen on a smooth Spanish pointer." Dr. Traill further observes, by way of comparison, that " the head of the Spotless cat is much more pointed, its nose more elevated, and its limbs are much more slender in proportion to its size, than in the puma. The strength of the jaws and size of the teeth are likewise proportionally less. In the puma the backs of the ears are black; in our animal they are of the same colour as the adjacent parts. The tail of the puma is claviform, or appears thickened towards the tip, which is black; but the tail of the Spotless cat is nearly of one thickness throughout, and it wants the conspicuous black tip." All that our authority has recorded of its habits may be summed up in a few words, namely, that it occupies the interior of large forests, preying upon monkeys, quadrupeds, and birds.

THE LION (*Felis Leo*)—Plate 8, fig. 28—occupies a much wider geographical range than the tiger, especially if we regard the Gambian and maneless forms as mere varieties of a single species. The latter kind are found in the Indian territory of Guzerat, and in the adjacent peninsula of Cutch. In all probability there is but one true species of lion, and this in general is characterized by the possession of a uniformly tawny or yellowish-ruddy fur, the tail presenting a bushy tuft of long black hairs at the tip. The male is also furnished with a large flowing mane, which covers the back part of the head, as well as the entire neck, extending over the shoulders to a greater or less extent. The young are frequently marked with roundish spots and dark stripes along the back. Curiously banded hybrids have also been occasionally produced by associating the lion with the tigress. In our introductory observations on the Carnivora, we have already dwelt on the structure of the skeleton of this most highly developed type of the order, and in our remarks on the Felidæ proper, we have been careful to illustrate the distinguishing characteristics common to the lion and its allies; but there still remains an apparently trifling matter which has given rise to much controversy, and cannot therefore be passed unnoticed. We allude to the occasional presence of a corneous thorn-like prickle developed at the extremity of the lion's tail. For a long period we remained sceptical as to the genuine character of this peculiar dermal process, conceiving it to be a merely accidental thickening or induration of the caudal integument, and serving no particular purpose in the economy of this animal's habits. The question has, however, been fairly set at rest by Messrs. Bennett and Woods; the former gentleman having, at a meeting of the Zoological Society of London in 1832, exhibited one of these claw-like appendages which had been previously removed from the tail of a lion then living in the society's menagerie, Regent' Park. This claw is about the third of an inch long, solid throughout the greater part of its extent, sharp at the apex, and slightly hollowed out at the base. Its function has been supposed to be connected with a lashing of the tail for the purpose of stimulating anger; but in our view it is more probably concerned in the action of scratching out or combing hair where portions of the fur have been accidentally matted together. Be that as it may, its existence is a remarkable fact; and what perhaps is still more strange, is, that its presence has recently received confirmation from a source of authority far more ancient than the oft-quoted statements of Didymus of Alexandria, who flourished forty years prior to the Christian era. The Assyrian sculptures plainly aver that the lion-hunting people of that early period, some seven hundred years before Christ, were well acquainted with this horny development, seeing that their artists have faithfully depicted it on the imperishable monuments of their ancient might! Strange, we repeat, that the elucidation of a long-disputed point in natural history and science, should at length receive assistance and confirmation from the disinterred memorials of a by-past race—of a people who bred and reared lions expressly for the chase and other kinds of sports! "Let the spectator," says M. Bonomi, in his attractive volume entitled, "Nineveh and its Palaces," "now examine these interesting sculptures, and consider for himself the various attitudes of the dead and dying lions, what a familiarity with the result of the various wounds each separate example displays! How this lioness, wounded in the spinal cord, drags her paralyzed hinder quarters after her! How that lion, wounded in the eye, puts up his paw with agony to the spot! How another, pierced with four arrows, is staggering in the last convulsion! How yet another, wounded in the brain, has fallen over on his back! How this one, wounded in the lungs, stops to pour out the life-stream! And lastly, how certain it is that the king and his court, and the inhabitants of Nineveh in general, must have been familiar with such exhibitions to have required so many cruel details at the hand of the artist!" These and other records also testify that in early times lions were extremely numerous in the eastern parts of Asia; and we also learn from Herodotus that they formerly existed in Europe, the baggage camels of Xerxes' army being, we are told, attacked in their march from Acanthus towards that part of Turkey now called Salonica. But in modern times it is to Africa that the lion-hunter directs his steps. Accordingly we have of late years, especially, received important additions to our knowledge of the instincts and habits of the lion; and it is now pretty well understood that the noble qualities ascribed to this beast by Buffon and his copyists, have existed only in their imaginations, since, on the contrary, it has been continually shown, that the lion, like the tiger, is ever ready to take advantage of a comparatively weak and unguarded prey, and by the execution of a momentary dash, to bring it to the ground. A full-grown lion weighs from thirty-five to nearly forty stone; consequently few animals can resist the fearful crash of such a weight falling upon them unawares. Except when pressed for food, the lion is certainly a rather lazy and indolent beast; but this unwillingness to commit havoc for the mere pleasure of the sport, does not entitle it to receive the character of being brave, noble, or magnanimous—qualities which it assuredly does not possess. If we turn our attention to the testimony of eminent and distinguished travellers, what do we find? Sparrman mentions the case of a farmer, named Jacob Kok, who, "when walking over his lands with his loaded gun, unexpectedly met a lion. Being an excellent shot, he thought himself pretty certain, from the position in which he was, of killing it, and, therefore, fired his piece. Unfortunately he did not recollect that the charge had been in it for some time, and consequently was damp; so that his piece hung fire, and the ball, falling short, entered the ground close to the lion. In consequence of this he was seized with a panic, and took directly to his heels; but, being soon out of breath, and closely pursued by the lion, he jumped on a little heap of stones, and there made a stand, presenting the but-end of his gun to his adversary, fully resolved to defend his life as well as he could to the utmost. This deportment had such an effect on his pursuer, that he also made a stand, and lay down at a distance of a few paces from the heap of stones, seemingly quite unconcerned. Jacob, in the meantime, did not stir from the spot; besides, he had in his flight unfortunately dropped his powder-horn. At length, after waiting a good half hour, the lion rose up, and at first went very slowly, and step by step only, as if he had a mind to steal off; but as soon as he got to a greater distance, he began to bound away at a great rate." Here, at all events, our lion did not exhibit much courage or bravery; and, as another instance of cowardice on the part of this so-called noble animal, we quote the statements of Captain Harris, who remarks that, early one rainy morning, when he and his companions were peeping out of their canvas-covered waggon, in order to ascertain if there was any prospect of its clearing up, they "perceived three lions squatted within a hundred yards, in the open plain, attentively watching the oxen. Our rifles," he adds, "were hastily seized, but the dampness of the atmosphere prevented their explosion. One after another, too, the Hottentots sprang out of the pack waggon, and snapped their guns at the unwelcome intruders as they trotted sulkily away, and took up their position on a stony eminence at no great distance. Fresh caps and priming were applied, and a broadside was followed by the instantaneous demise of the largest, whose cranium was perforated by two bullets at the same instant. Swinging their tails over their backs, the survivors took warning by the fate of their companion, and dashed into the thicket with a roar. In another half hour the voice of *Leo* was again heard at the foot of the mountains, about a quarter of a mile from the camp; and from the waggon-top we could perceive a savage monster rampant, with his tail hoisted and whirling in a circle, charging furiously along the base of the range, and in desperate wrath making towards John April, who was tending the sheep. Every one instinctively grasped his weapon and rushed to the rescue, calling loudly to warn the expected victim of his danger. Without taking the smallest notice of him, however, the infuriated monster dashed past, roaring and lashing his sides, until concealed in the mist." So much for the lion's courage. Another false appellation by which he is known, is that of the dignified title of "monarch of the forest;" but, as Mr. Burchell remarks, this name is not very applicable, seeing that he is seldom seen except amongst low thickets and brushwood, or in the open plains. Captain Harris, who employs the misnomer without comment, is very careful to tell us, that the fine specimens seen in our menageries are, as it were, "but the shadow of that animal which clears the desert with his rolling eye." No doubt our semi-domesticated examples lose something of that lustre of the eye, and breadth of limb, which characterize the wild and unfettered beast; nevertheless, our conceptions of a lion's strength are perhaps as accurately realized by an examination and dissection of such examples as are brought over, or even bred in this country, as by the description and poetical language above adopted. In the sad story given by Mr. Gordon Cumming, of the seizure and death of a Hottentot named Hendrick, the lion's attack was of the most cowardly character. "It appeared that when the unfortunate Hendrick rose to drive in the ox, the lion had watched him to his fireside; and he had scarcely lain down when the brute sprang upon him and Ruyter (for both lay under one blanket) with his appalling murderous roar, and, roaring as he lay, grappled him with his fearful claws, and kept biting him on the breast and shoulder, all the while feeling for his neck; having got hold of which, he at once dragged him away backwards round the bush into the dense shade. As the lion lay on the unfortunate man, he faintly cried—'Help me, help me, O God! men, help me!' after which the fearful beast got hold of his neck, and then all was still, except that his comrades heard the bones of his neck cracking between the teeth of the lion." With regard to the death-dealing strength of the lion's paw, Mr. Burchell relates the following incident:—While he and his friends were out hunting, they sprung a lion and lioness. The latter soon disappeared, but the former made a slight advance, as if to show fight. "At this instant the dogs boldly flew in between us and the lion, and, surrounding him, kept him at bay by their violent and resolute barking. The courage of those faithful animals was most admirable. They advanced up to the side of the huge beast, and stood making the greatest clamour in his face, without the least appearance of fear. The lion, conscious of his strength, remained unmoved at their noisy attempts, and kept his head turned towards us. At one moment the dogs, perceiving his eye thus engaged, had advanced close to his feet, and seemed as if they would actually seize hold of him; but they paid dearly for their imprudence: for, without discomposing the majestic and steady attitude in which he stood fixed, he merely moved his paw, and at the next instant I beheld two lying dead. In doing this he made so little exertion, that it was scarcely perceptible by what means they had been killed. Of the time which we gained by the interference of the dogs, not a moment was lost. We fired upon him; one of the balls went through his side, just between the short ribs, and the blood began to flow; but the animal still remained standing in the same position. We had now no doubt that he would spring upon us. Every gun was instantly reloaded; but happily we were mistaken, and were not sorry to see him move quietly away, though I had hoped in a few minutes to have been enabled to take hold of his paw without danger."

As to the destructive habits of the lion, Mr. Andersson tells us of one powerful beast slain by Messrs. Galton and Bam, which only a short time previous had killed upwards of fifty oxen, cows, and horses! In its stomach, when shot, was a small dog bitten into five pieces, the little animal having incautiously approached the lion during the hunt. Many other interesting details regarding the habits of the lion are given by this most successful hunter. On one occasion Mr. Andersson had a marvellously lucky escape. When eating his dinner, a number of native damaras and mamaques came to tell him that an *ongeama*, as they call it, had destroyed one of their goats, and that they hoped he would help them to kill it. He consented. The lion had taken refuge in a dense tamarisk brake, and Mr. Andersson says:—"I had proceeded for some time, when suddenly, and within a few paces of where I stood, I heard a low, angry growl, which caused the dogs, with hair erect in the manner of hogs' bristle, and with their tails between their legs, to slink behind my heels. Immediately afterwards a tremendous shout of "ongeama! ongeama!" was raised by the natives on the bank above, followed by a discharge of fire-arms. Presently, however, all was still again; for the lion, as I subsequently learnt, after showing himself on the outskirts of the brake, had retreated into it. Once more I attempted to dislodge the beast; but finding the enemy awaiting him in the more open country, he was very loath to leave his stronghold. Again, however, I succeeded in driving him to the edge of the brake, where, as in the first instance, he was received with a volley; but a broomstick would have been equally efficacious as a gun in the hands of these people, for out of a great number of shots that were fired, not one seemed to have taken effect. Worn out at length with my exertions, and disgusted beyond measure at the way in which the natives bungled the affair, I left the tamarisk brake, and, rejoining them on the bank above, offered to change place with them; but my proposal, as I expected, was forthwith declined. As the day, however, was now fast drawing to a close, I determined to make one other effort to destroy the lion, and, should that prove unsuccessful, to give up the chase. Accordingly, accompanied by a single native, I again entered the brake in question, which I examined for some time without seeing anything; but on arriving at that part of the cover we had first searched, and when in a spot comparatively free from bushes, up suddenly sprung the beast within a few paces of me. It was a black-maned lion, and one of the largest I ever remember to have encountered in Africa. But his movements were so rapid, so silent and smooth withal, that it was not until he had partially entered the thick cover—at which time he might have been about thirty paces distant—that I could fire. On receiving the ball he wheeled short about, and, with a terrific roar, bounded towards me. When within a few paces, he couched as if about to spring, having his head imbedded, so to say, between his fore-paws. Drawing a large hunting-knife and slipping it over the wrist of my right hand, I dropped on one knee, and, thus prepared, awaited his onset. It was an awful moment of suspense, and my situation was critical in the extreme. Still my presence of mind never for a moment forsook me—indeed, I felt that nothing but the most perfect coolness and absolute self-command would be of any avail. I would now have become the assailant; but as—owing to the intervening bushes, and clouds of dust raised by the lion's lashing his tail against the ground—I was unable to see his head, while to aim at any other part would have been madness, I refrained from firing. Whilst intently watching his every motion, he suddenly bounded towards me; but—whether it was owing to his not perceiving me, partially concealed as I was in the long grass, or to my instinctively throwing my body on one side, or to his miscalculating the distance—in making his last spring, he went clear over me, and alighted on the ground three or four paces beyond. Instantly, and without rising, I wheeled round on my knee, and discharged my second barrel, and, as his broadside was then towards me, lodged a ball in his shoulder, which it completely smashed. On receiving my second fire, he made another and more determined rush at me; but, owing to his disabled state, I happily avoided him. It was, however, only by a hair's breadth, for he passed me within arm's length. He afterwards scrambled into the thick cover, beyond where, as night was then approaching, I did not deem it prudent to pursue him." Next morning they found the spot where the poor brute had passed the night in sleepless agony; but it was not until the expiration of several days that his carcase was found, then in a state of decomposition; and thus ends the story. Many other narrow escapes are recorded by Mr. Andersson, some of which are even more astonishing. In most instances it would appear that these escapes depend upon the cowardice of the lion, which also does not seem to be able to recognize the proper moment when an intended victim is entirely within its power. Thus, for example, what can be more extraordinary than the following incident, given by the same gentleman?—An old waggon-driver, Piet by name, "riding along one morning in a very weak state, having just recovered from a severe fever, a lion suddenly rushed on him. The ox became frightened, and threw the old man. One of his feet was caught in the stirrup; but, fortunately, the 'weld' shoe slipped off. 'I know,' said the old veteran hunter, 'I was thrown, and that I got on my legs again, but in what manner is quite a mystery to me to this day. I called, as loud as my feeble voice permitted, to my people to bring a gun, the lion always getting nearer and nearer, until he stood within arm's length. I once or twice tried to pull out my pistol or my sword-knife, which, as you know, I usually carry about with me, but in my anxiety I missed them. My jacket was lying just in front of me on the ground, but the brute had one of his paws on it. I felt desperate, however, and, pulling it forcibly away, struck the lion on the head, when he grinned and growled terribly, and I expected every moment he would tear me to pieces. At this juncture my damara, who fortunately had heard my cries of distress, came running up with my gun. Taking the piece from the man, I fired at the lion, who had retreated a few paces, where he sat quietly looking at me. I dont know whether I hit him, for what with the sudden fright and my weak constitution, I felt very unsteady. Be that as it may, it had at all events the effect of scaring him away, for at the report of the gun he instantly betook himself to cover.'" In such cases as the above, one cannot but recognize a providentially-implanted fearfulness in the the lion, which frequently gives to the human victim an opportunity of escape; and perhaps, therefore, those instances of deliverance, where the animal has already partially succeeded in overcoming his intended prey, ought to be considered the more remarkable—such, for example, as that of the escape of Dr. Livingstone, which is described by the distinguished missionary himself as follows:—"Being about thirty yards off, I took a good aim at his body through the bush, and fired both barrels into it. The men then called out, 'He is shot, he is shot!' Others cried, 'He has been shot by another man too; let us go to him!' I did not see any one else shoot at him, but I saw the lion's tail erected in anger behind the bush, and, turning to the people, said, 'Stop a little till I load again.' When in the act of ramming down the bullets I heard a shout.

Starting, and looking half round, I saw the lion just in the act of springing upon me. I was upon a little height; he caught my shoulder as he sprang, and we both came to the ground below together. Growling horribly close to my ear, he shook me as a terrier dog does a rat. The shock produced a stupor similar to that which seems to be felt by a mouse after the first shake of the cat. It caused a sort of dreaminess, in which there was no sense of pain nor feeling of terror, though quite conscious of all that was happening. It was like what patients partially under the influence of chloroform describe, who see all the operation, but feel not the knife. This singular condition was not the result of any mental process. The shake annihilated fear, and allowed no sense of horror in looking round at the beast. This peculiar state is probably produced in all animals killed by the Carnivora; and if so, is a merciful provision by our benevolent Creator for lessening the pain of death. Turning round to relieve myself of the weight, as he had one paw on the back of my head, I saw his eyes directed to Mebalwe, who was trying to shoot him at a distance of ten or fifteen yards. His gun, a flint one, missed fire in both barrels; the lion immediately left me, and, attacking Mebalwe, bit his thigh. Another man, whose life I had saved before, after he had been tossed by a buffalo, attempted to spear the lion while he was biting Mebalwe. He left Mebalwe and caught this man by the shoulder; but at that moment the bullets he had received took effect, and he fell down dead. The whole was the work of a few moments, and must have been his paroxysm of dying rage. In order to take out the charm from him, the Bakatla on the following day made a huge bonfire over the carcase, which was declared to be that of the largest lion they had ever seen. Besides crunching the bone into splinters, he left eleven teeth wounds in the upper part of my arm."

In attacks on the more powerful quadrupeds, the lion seldom approaches them singly. Thus, Messrs. Oswell and Vardon witnessed three male lions pulling down a buffalo, and they were enabled to shoot two of the plunderers on the spot. Again, Mr. Andersson saw no less than five lions, two of which were in the act of similarly destroying "a splendid giraffe, the other three watching close at hand," ready to take part in the deadly strife. The last-named sportsman also mentions two instances where the lion had been guilty of cannibalism. In one case a male had devoured a lioness, having apparently quarrelled over an insufficient meal, consisting of a spring-bok, on which they had evidently been feasting together! In the other case, after Mr. Andersson and his friends had severely wounded a male, a whole troop of lions immediately rushed upon their disabled brother and tore him to pieces. In all these incidents the true cowardly character of the species is very conspicuous, and it cannot therefore be affirmed, we repeat, that the lion is either brave or magnanimous. In regard to the power of the lion's roar, Dr. Livingstone's observations are too important to pass unnoticed—"The same feeling," says this eminent traveller, "which has induced the modern painter to caricature the lion, has led the sentimentalist to consider the lion's roar the most terrific of all earthly sounds. We hear of the 'majestic roar of the king of beasts.' It is indeed well calculated to inspire fear if you hear it in combination with the tremendously loud thunder of that country, on a night so pitchy dark that every flash of the intensely vivid lightning leaves you with the impression of stone-blindness, while the rain pours down so fast that your fire goes out, leaving you without the protection of even a tree, or the chance of your gun going off. But when you are in a comfortable house or waggon the case is very different, and you hear the roar of the lion without any awe or alarm. The silly ostrich makes a noise as loud, yet he never was feared by man. To talk of the majestic roar of the lion is mere majestic twaddle. On my mentioning this fact some years ago, the assertion was doubted, so I have been careful ever since to inquire the opinions of Europeans, who have heard both, if they could detect any difference between the roar of a lion and that of an ostrich; the invariable answer was, that they could not when the animal was at any distance. The natives assert that they can detect a variation between the commencement of the noise of each. There is, it must be admitted, a considerable difference between the singing noise of a lion when full, and his deep, gruff voice when hungry. In general the lion's voice seems to come deeper from the chest than that of the ostrich; but to this day I can distinguish between them with certainty only by knowing that the ostrich roars by day and the lion by night." The lion, as we have seen, is rather timid than courageous; the testimony of Burchell, Harris, Cumming, Andersson, Livingstone, and many others, clearly showing that it entertains great fear of man. Whilst this mighty beast is actually enjoying a hearty meal, by merely walking up, Captain Harris causes it to march off forthwith. Many similar incidents are also recorded by these distinguished travellers; Dr. Livingstone going so far as to assure us, that there is "more danger of being run over when walking in the streets of London than of being devoured by lions in Africa, unless engaged in hunting the animal." Lions are still very abundant in the interior of that country, but, with an extending civilization, and a more constant supply of fire-arms to the natives, it may be fairly predicted that the regions of the south will ere long become as completely emptied of this huge beast of prey, as have been the once infested districts of Greece and Asia Minor.

ORDER VI.—PINNIPEDIA.

THIS order of amphibious mammals, though, for convenience, here treated as a distinct group, cannot be regarded as zoologically equivalent to any of the foregoing ordinal divisions, inasmuch as it only represents a peculiar section of the Carnivora, properly so called. In accordance, therefore, with the system indicated at the commencement of this work, the Pinnipeds or Seals are here considered separately. The most marked and obvious peculiarity in their organization, consists in the conversion of the limbs into paddles or swimming feet—the modifications of structure by which this change is brought about being best understood by an examination of the skeleton (Plate 34, fig. 114). Bearing in mind what we have already pointed out respecting the osteology of the typical carnivor, it will be noticed that the several skeletal elements of the seal are more or less attenuated, compressed, and shortened, according to circumstances. Thus, instead of the broad massive skull, we have a rather elongated cranium, associated with a movable spine, which is even more flexible than that of ordinary cats. The bones of the pelvis are particularly slender, and but feebly developed, while the shoulder-blades are, on the other hand, remarkably broad. There are no clavicles. The homologous arm and thigh bones, that is, the humeri and femora, are much shortened. The bones of the fore-arm are considerably flattened; and, in the conformation of the hand, the adaptation of the limb for natatory purposes is eminently significant. It will be observed that the phalanges are drawn out, as it were; and, diverging from one another, like the spokes of a wheel, they form mutually-resisting supports for the interdigital webs. The hind paddles, with their membranous expansions, are similarly constructed, stretching out posteriorly in a horizontal direction. All the feet are pentadactylous, the toes of the anterior extremity becoming, one after another, shorter from the thumb outwards. The outer and innermost toes of the hind feet are the most extensively developed. The forward movements of the body upon land are produced by a rapid succession of short shuffling or wriggling leaps, entirely due to the contraction of the muscles of the trunk, and altogether independent of the limbs, the latter only being employed in clambering up the sides of projecting rocks. Generally speaking, the bones are light and spongy in texture; and this circumstance—when taken in connection with the boat-like form of the body, which terminates posteriorly in a short and conical tail, the oar-like limbs, the smooth adpressed fur, together with the flexible spine and powerful muscles — satisfactorily demonstrates how much care has been taken to render these creatures swift, easy, and vigorous swimmers.

FAMILY I.—PHOCIDÆ.

The true Seals have been divided into four sub-families or minor groups, but their differentiating characters are scarcely sufficient to warrant such an arrangement. The teeth are usually thirty-four in number, of which there may be reckoned six or only four incisors above, and four or two below, together with four canines, and twenty or twenty-two molars; all having the crowns armed with trenchant conical points. The tongue is smooth and bifid at the tip; the stomach is simple, the intestinal canal being comparatively long. In connection with the liver, the posterior vena cava has a sacculated expansion, the use of which is to prevent the necessity of rapid respiration, thereby prolonging the animal's power of remaining under water. The venous blood is thus retarded in its course back to the lungs, until the animal rises for a fresh supply of air. During the action of diving, the nostrils are closed by a muscular sphincter. Under ordinary circumstances seals can remain submerged from fifteen to twenty minutes; and it is stated that, during sleep, they will remain in this condition for as much as an hour, without coming to the surface to breathe. The shining, glossy, adpressed hairs are protected from an injurious action of the water, by an oily secretion which exudes from the skin. Their margins are sinuous, but the long, stout, horny whiskers are uniformly smooth. Seals are for the most part marine, but a few of them pass up the mouths of rivers to fresh-water streams, and even lakes. While at rest, they are usually seen reposing on the ledges of rocks, and basking in the sun; and on being alarmed, they suddenly plunge into the water for security. These animals, as is well known, subsist principally on various kinds of fish; but they will also devour crabs, molluscs, and other oceanic products. Fossil remains of seals occur in the miocene and pliocene deposits.

THE COMMON SEAL (*Phoca vitulina*)—Plate 12, fig. 40—is an inhabitant of the northern seas generally, and was formerly very abundant all along the western coasts of the British islands, as well as those of France; now, however, it is comparatively scarce, except on the shores of Scotland, and its adjacent northern and western isles. The body of the seal is between four and five feet long, having an ashy or yellowish-grey ground colour, which is indistinctly spotted with light brownish-black patches; it exhibits a cylindro-conical form, gradually diminishing in bulk from the region of the chest towards the short broad muzzle in front, and towards the rudimentary tail behind. The eyes are rather large, and protected by a few stiff hairs, forming small eyebrows; the ears being fully-developed, and scarcely visible. One of the most interesting peculiarities by which this species is distinguished, consists in the oblique disposition of the molar teeth, producing a slight overlapping of the ends; this remarkable character having been first pointed out by Professor Nilsson. The brain is largely developed—a fact which in some measure explains that high degree of intellectual manifestation, which the seal is capable of displaying. Though very timid in the wild state, and very difficult to approach with a gun, it is, nevertheless, extremely docile in a semi-domesticated condition. From the earliest times it has been tamed and taught to perform a number of tricks, and to utter certain responsive sounds, when spoken to by its master. A seal thus instructed has been exhibiting in London, under the title of the "talking and performing fish;" its so-called wonderful performances, however, as might be expected, do not equal the absurdities of a puffing and exaggerating advertisement. Mr. Low, in his "Fauna Orcadensis," observes, that in the wild state, "seals seem to have a great deal of curiosity; if people are passing in boats, they often come quite close up to the boat, and stare at them, following for a long time together; if people are speaking loud, they seem to wonder what may be the matter. The church of Hoy, in Orkney, is situated in a small sandy bay, much frequented by these creatures; and I observed, when the bell rang for divine service, all the seals within hearing swam directly to the shore, and kept looking about them, as if surprised rather than frightened, and in this manner continued to wonder as long as the bell rung." Their powers of hearing are remarkably acute, as we have recently verified by speaking softly to the active little seal at present living in the Zoological Society's Gardens, Regent's Park; even while the animal is under water, the very faintest whisper of its name—"Jenny"—does not fail to elicit immediate attention and expectancy. In high northern latitudes the seal is of the greatest economic value. To the Greenlanders it affords an almost exclusive means of subsistence—supplying, as it does, food for the inner man, clothing for the outer man, and light for their ill-furnished dwellings. The seal is also an important article of commerce. A full-grown specimen of this species, if taken in spring, will yield from four to five gallons of oil, while some of the larger kinds will supply considerably more than double that quantity. If extracted while fresh, the oil is beautifully clear and transparent, inodorous, and of a rather pleasant taste. The skin is either prepared with the fur, or tanned to make leather; in either case it is in great demand for making shoes, caps, and other articles of clothing.

THE HARP SEAL (*Phoca Grœnlandica*) is, as its specific name implies, found very abundant on the ice-bound shores of Greenland, being also an inhabitant of Iceland, and the northern coasts generally, from Newfoundland along the borders of the Frozen Ocean, as far as the sea of Kamtschatka It is also occasionally transported southward to the western shores of our own sea-girt islands. The fur presents a greyish-white colour, the back being marked by a blackish horseshoe-shaped band, arching backwards from the region of the shoulder to within a few inches of the root of its stumpy tail. This band is broad at the sides, while its outline is very irregular; the anterior half of the head exhibits the same deep brownish-black colour, imparting to the physiognomy a very peculiar look. The molar teeth do not overlap each other, but they leave slight interspaces between their several ends. In regard to the habits of this species, Fabricius states that they leave the coasts of Greenland twice a-year, namely, in March and July, revisiting their haunts in May and September. Their food consists of molluscs and fish, especially salmon. Being stupid and incautious, they fall an easy prey to the seal-hunters; their fur is much valued, and is less woolly than that of the common species. The female produces one, or rarely two, cubs at a birth; the skins being either white or cream-coloured. These seals have a tendency to congregate and herd together on floating masses of ice at a considerable distance from the shore, under the leadership of one of their number.

THE MARBLED SEAL (*Phoca annulata*) inhabits the coasts of France, and was supposed by Frederick Cuvier to be only a variety of the common species. Professor Nilsson of Copenhagen, however, has determined otherwise. At one time it was believed that this species had been taken on our own coasts, but the impression appears to have been erroneous; it is certainly not improbable that it should find its way thus far northward. The body is about as large as that of *Phoca vitulina*, but it is at once distinguished from it, by the peculiar marbled colour of the fur. A very lively specimen of the Marbled seal, formerly kept in the Jardin des Plantes, afforded the Parisian and other visitors much amusement. Two little dogs were housed with it, and the trio lived on excellent terms; the seal allowing them to take fish out of its mouth while eating, and submitting to many other indignities.

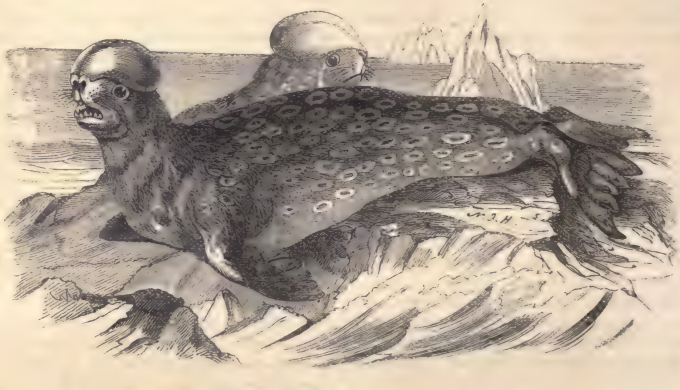
THE GREAT SEAL (*Phoca barbata*) is occasionally found on the northern shores of Scotland; and, according to Mr. Selby, it is an inhabitant of the Farn and Staple islands, off the coast of Northumberland. The body of a full-grown species measures as much as ten, twelve, or even fourteen feet in length, and weighs upwards of forty-five stone. The head is comparatively long, and much arched in front; the eyes are large, the auditory opening being also capacious. The fore-feet have the central toe longest, the outermost on either side being comparatively short. In the adult animal the fur presents a deep brownish-black colour, but in the young state it is of light-greenish hue. The female is provided with four teats, and Mr. Selby states that it "calves in the month of November upon several of the outer rocks, where the young are suckled every tide for the space of fourteen or fifteen days, when the long woolly fur which at first clothed them is cast, and a new covering of close short hair supersedes it; they are then conducted by the dam to the water, from whence they only emerge at intervals."

THE GREY SEAL (*Halichœrus gryphus*) is also an inhabitant of the British coasts, being especially abundant on the Irish shores. Professor Nilsson—an excellent authority—states that those living in the Baltic have solitary habits; but, in the neighbourhood of Cork and Waterford, Dr. Ball found them gregarious in small numbers. The Grey seal is also a native of the northern coasts of Europe, and is called the *Utselur* by the Icelanders. Zoologically speaking, it is a species of very great interest, because its structural characters, in some particulars at least, approach very closely those of the walrus; Dr. Gray, indeed, considers it entitled to be regarded as a member of the family which that peculiar form represents. Be that as it may, the canines are present in the lower jaw, while those of the upper are not prolonged into tusks—features which sufficiently distinguish the Phocidæ from the Trichecidæ. According to Reinhardt, the upper jaw is frequently furnished with a sixth molar on either side, which would make the total number of grinders to be twenty-two. The superior series are simple, displaying only a single pointed crown, but those of the lower jaw are slightly tuberculated. The head is remarkably flat, terminating anteriorly in a broad, truncated muzzle. One of the most striking peculiarities of this species—and one in which it very closely resembles the walrus—consists in the disproportionate size of the brain, as compared with that of the common seal; while the bones of the face are, on the other hand, more cogently developed. The late Dr. Ball of Dublin, in a communication to Professor Bell—after alluding to the fruitless attempts made by his father to rear and tame specimens—has very forcibly remarked that this seal "appears scarcely susceptible of domestication, and the development of the skull seems to indicate as much; for the size of the brain of a specimen nearly eight feet long, did not exceed that of one of *Phoca variegata* (*i.e.*, *P. vitulina*), of less than four feet."

THE SEA-LEOPARD (*Leptonyx Weddellii*). — M. Frederick Cuvier formerly associated the various species of Leptonyx, under the generic title of *Stenorhynchus*. They are characterized by the possession of twenty-two teeth, of which eight are incisors, besides the usual number of canines, and twenty molars—each of the latter being provided with three sharp, conical, prong-like tubercles. All of these are slightly compressed, and point more or less upwards and backwards; the central cusp being the longest, and separated from the lateral pair by a deep notch on either side. The hindermost molars are furnished with double fangs. The skull is narrow, elongated, and rather depressed at the centre of the vertex. The claws of the feet are comparatively small, especially those of the hind pair. This species inhabits the shores of the southern hemisphere.

THE CRESTED SEAL (*Stemmatopus cristatus*), or Hoodcap, differs from the ordinary seals, inasmuch as it possesses a remarkable organ, situated at the anterior part of the head. This structure consists of a membranous and muscular pouch, which is divided internally into two compartments by the prolongation of the cartilaginous septum of the nose (fig. 37). By closing its nostrils, the animal has the power of inflating this sac, which then stretches back over the cranium, and in the distended condition rises six or seven inches above the vertex. The molar teeth are irregularly tuberculated. The Hoodcap lives chiefly on large floating fields of ice off the coasts of Greenland and the north-eastern shores of America, being seldom seen on land, except in the months of April, May, and June. It is a large species, measuring seven or eight feet in length; and great numbers are annually destroyed by the seal-hunters.

Fig. 37.

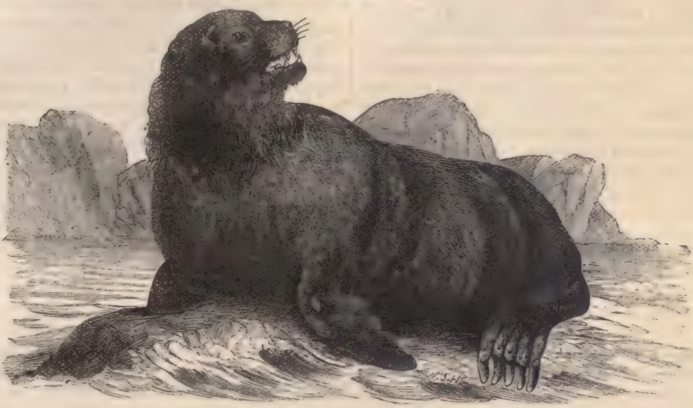


The Crested Seal (Stemmatopus cristatus).

THE SEA-BEAR (*Arctocephalus ursinus*)—Plate 13, fig. 41—is a native of the north-western shores of America, as well as the coasts of Kamtschatka and the Kurile islands. It is a large, bulky species, upwards of seven feet long. The fur is thick, of a woolly texture, of a greyish-brown tint in the adult, but quite black in the young animal. The ears are comparatively well-developed, being an inch and a half in length, and clothed with hair. There are ten incisor teeth, six above and four below, the four central ones of the upper series having flat and transversely-grooved crowns; the molars are twenty-two in number. The first toe of the fore-foot is the longest, the remainder gradually shortening in succession, outwards. The interdigital membranes of the hind feet are prolonged considerably beyond the toes in the form of bands. The Sea-bears are polygamous in their habits, a single male jealously guarding upwards of fifty or sixty females. The males are very fierce, as are also the dams when their young are hunted; if wounded, they utter a loud whining cry. The fur is highly valued.

THE SEA-LION (*Otaria jubata*).—Much discrepancy of opinion has all along existed in regard to the distinctions of these aberrant forms of seals, and even now much confusion remains respecting them. Several species have been included under the above title by different voyagers. The true Sea-lion is a huge animal, the males measuring from ten to fifteen feet in length (fig. 38). The fur has a yellowish-brown colour, the neck of the male being provided with a well-developed mane. The ears are only half an inch in length, or rather more, the muzzle being armed with numerous stout long whiskers. This species is also polygamous, a single male tending from twenty to thirty females. They are very fierce and powerful animals, waging destructive wars upon the sea-bears. The Sea-lion is principally found off the coasts of Terra-del-Fuego and the Falkland Islands.

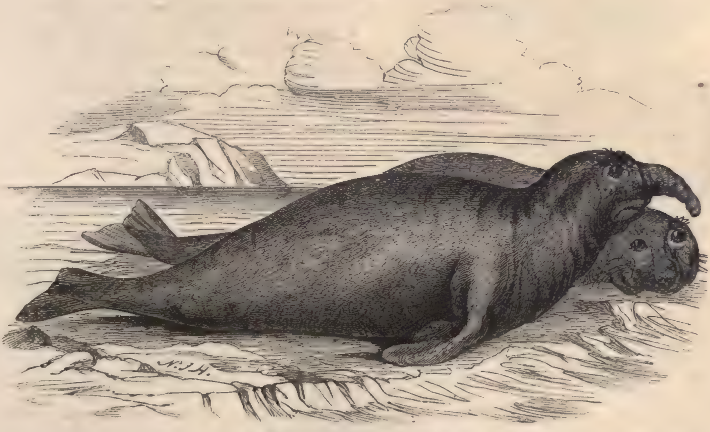
Fig. 38.



The Sea-Lion (Otaria jubata).

THE SEA-ELEPHANT (*Morunga proboscidea*) is a gigantic and extraordinary-looking animal. In Professor Nilsson's arrangement it is described as a species of *Cystophora*, a genus which is equivalent to the *Macrorhinus* of F. Cuvier. The title here employed is that given in the list of Phocidæ contained in the British Museum. The body of an adult Sea-elephant attains the enormous length of four-and-twenty feet, some specimens, it is said, considerably exceeding this measurement; the young at the time of birth being about the size of a full-grown *Phoca vitulina!* The most singular feature in this species, however, consists in the presence of a strongly-developed proboscidiform muzzle in the male, capable of being extended to a distance of twelve inches beyond the mouth, and conse

Fig. 39.



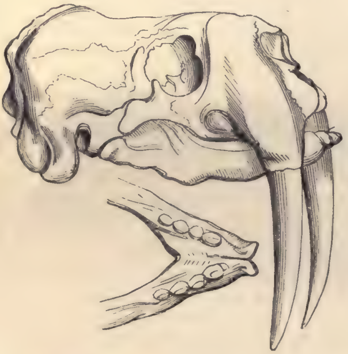
The Sea-Elephant (Morunga proboscidea).

quently imparting a very peculiar, if not hideous aspect (fig. 39). In the female there is no trace of this singular apparatus. The canine teeth are large, thick, rather sharply pointed, and curved upwards; the molars being furnished with simple, conical, and irregularly constricted conical crowns. The Elephant-seal enjoys a wide geographical distribution in the southern hemisphere, being found on the coasts of Australia, Kerguelend's Land, the Falklands, and other islands both of the South Pacific and Atlantic oceans. It is greatly valued on account of the large quantity of oil which it yields; and, although powerful, it is a comparatively harmless animal, and easily destroyed. Its skin is very thick, and, from its durability when prepared, is much employed in making carriage harness. The habits of the Sea-elephant are somewhat peculiar, inasmuch as it frequents the mouths of rivers, resorting betimes to fresh-water swamps and inland lakes. The male is said to utter when attacked a strange, hoarse, gurgling, wild sound; the voice of the female having some resemblance to the bellowing of an ox. A sailor once lost his life from the violence of an enraged female, in whose presence he had the cruel folly to skin her young one. The dam generally produces two cubs at a birth, the growth of which is so astonishingly rapid, that in eight days they have doubled their natal dimensions. The period of gestation is believed to be between nine and ten months.

FAMILY II.—TRICHECIDÆ.

Externally, the members of this family, as originally established, have a general resemblance to the ordinary seals; but in the form and arrangement of the teeth there are differences of the most marked kind. The cranium is also very unlike that of the typical Phocidæ; but in certain of the aberrant genera, this variation is less conspicuous. We have shown this to be the case, especially, in the genus Halichœrus, which is even associated with the present family in the systematic classification of Dr. J. E. Gray. On carefully examining the skull of a walrus (fig. 40), the first thing that strikes one is the massive character of all the bones, more particularly those of the anterior part of the face. All the facial modifications here witnessed have reference to the enormously developed tusks; and, consequently, it is in the superior maxillary bone that the more striking morphological changes have taken place. The extension upwards and downwards, as well as the great breadth of this osseous mass, has become necessary, in order to insure the reception and fixation of the base of this rootless and huge canine tooth—the socket, of course, being extremely capacious. This curious osteological change of form has also had the effect of producing an unusually broad muzzle, tilting up, as it were, the aperture of the nostrils. Scarcely less remarkable is the correlative effect produced by these huge canines on the shape of the lower jaw; but here, instead of increasing the width, we find the anterior part of the bone much narrowed and compressed, so as to pass securely forward, between and beyond the not very widely separated tusks—an arrangement which has likewise involved corresponding peculiarities in the dental formula of the adult animal. According to the investigations of Macgillivray, Rapp, Wiegman, and others, there are either ten or twelve incisors, four canines, and eighteen or twenty molars in the young animal; out of these, two grinders, the lower pair of canines, and all the incisors are deciduous, their sockets at length becoming entirely obliterated. We have thus left behind in the full-grown animal only sixteen permanent molars, besides the two tusks developed from the upper jaw; the former are depressed, obliquely truncated, and flat on the crowns; while the tusks, which are directed downwards with a slight curving inwards, measure from fifteen to twenty or twenty-five inches in length, weighing between eight and ten pounds each; they are also proportionately thick. The cranial cavity is small when compared with that of the typical Phocidæ.

Fig. 40.



Skull and section of the lower jaw of the Walrus.

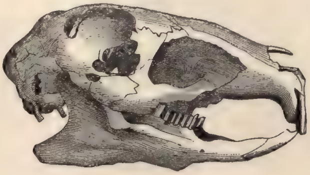
THE WALRUS (*Trichechus Rosmarus*), or MORSE—Plate 13, fig. 42—is the only representative of the present family, if we are content to adhere to the arrangement above given. It is a large, bulky animal, the body usually measuring from ten to fifteen feet in length, and, in the case of the males, as much sometimes as twenty feet. The fur is of a deep brownish-black colour, becoming lighter as age advances. The head is comparatively small, terminating anteriorly in an abrupt snout, which is tumid at the sides and clothed with long and very stout whiskers. The lips are particularly thick, while the nostrils are rounded and placed high up on the summit of the muzzle. The auditory apertures are placed well back, but there is no trace of an external auricle; the eyes are comparatively small. The limbs are short, terminating in broad pentadactylous paddles or flippers, having strong interdigital webs. Sir Everard Home's notion that they possessed the power of producing a vacuum to aid the action of climbing, is entirely erroneous. The Walrus is an inhabitant of the shores of the Arctic ocean, being especially abundant on the coasts of Spitzbergen, Nova Zembla, and Behring's Straits. These animals congregate together in herds, varying in number from fifty to one hundred or more; nevertheless their habits are strictly monogamous. Before going to sleep on the floating ice-fields they take the precaution of appointing sentinels, who, when any danger threatens, forthwith rouse the entire troop, by uttering loud bellowing cries, and instantly all are seen tumbling over into the sea, where they are tolerably secure. If any are wounded the remainder display much sympathy, the mothers defending and carrying off their young with the greatest ardour. On several occasions they have been known to attack a boat's crew, as happened, for example, to two officers who went walrus-hunting by themselves, near Waggat's Straits, in the year 1773. They had succeeded in wounding a solitary one, which immediately dived under water, and after a short time returned with several others, attacked the officers, wrested from them an oar, and very nearly succeeded in capsizing the boat; fortunately another boat came to their assistance, and the infuriated animals were driven off. At all times the capture of the Walrus is attended with considerable difficulty, for, although not naturally a shy animal, it has learned to dread its human adversary, and therefore takes to the water on the slightest alarm; moreover, the skin is sufficiently hard to resist the harpoon, unless it has been driven home with great force. The tusks are much prized; their ivory being, bulk for bulk, far more valuable than that of the elephant; the texture of the dentine is denser, and the colour of a purer white. The Walrus is omnivorous, and in its stomach there have been found remains of young seals, fish, shrimps, and other crustacea; also various kinds of molluscs and sea-weeds, especially of the common kind—*Fucus digitatus*.

Those who desire further information respecting the habits and mode of capturing the Walrus, we beg especially to refer to the thirteenth and thirtieth chapters of the first volume of Dr. Kane's "Arctic Explorations," where they will find most interesting details, for which we have here no space.

ORDER VII.—RODENTIA.

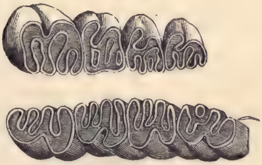
THE Rodents constitute a well-defined natural group, comprehending a great multitude of comparatively small species, all of which are characterized by the possession of peculiar incisor teeth. These organs are usually four in number, two occupying the upper, and two the lower jaw; they are also placed prominently forward below the muzzle, and are separated from the molar teeth by a considerable interspace (fig. 41). Their office is essentially that of gnawing; hence the Rodents are sometimes called gnawers, or *rongeurs* by the French. The form of each incisor tooth resembles a chisel, the anterior and superior edge being remarkably sharp and trenchant; the tooth is likewise so constructed that its tissue, and therefore function also, is in no way damaged by continuous use; on the contrary, every time it is put in action, the weapon chisels down the hard substances required for food or other purposes, while, at the same time, it sharpens itself, and is thus always fit for use. This interesting result depends, for its integrity, on the following structural arrangement: The anterior and convex surface of the organ is coated with a thin layer of hard enamel, the central mass consisting of the somewhat less dense, but still tolerably strong ivory; and from this disposition of the two structures, it will readily be perceived that, during attrition, the ivory must wear away more quickly than the enamel, which is consequently left standing prominently forward in the form of a chisel-like process. The molar teeth are few in number, seldom exceeding four on each side of either jaw; they are flat, and have the enamel arranged in the form of transverse plates, which, during the backward and forward movements of the jaw, act antagonistically with the corresponding ridges of the opposed teeth (fig. 42). In order to insure and facilitate this antero-posterior movement, and the converse action, the condyle of the lower jaw is articulated to the skull by a longitudinally-formed socket, which admits of scarcely any lateral motion. There are no canine teeth in the Rodentia; and from the several dental peculiarities here mentioned, it may readily be perceived that the food of these animals must be chiefly of a frugivorous nature, and that it will comprise substances of the hardest character, such as roots, the bark of trees, and even wood itself. Some of the species, however, are omnivorous, feeding on other animals, as well as on various vegetable matters; and in these we find the molar teeth more or less tuberculated. The alimentary canal is of great length, the cœcum being often remarkably large, in some cases exceeding the stomach in size, and filling up the larger portion of the abdominal cavity. A curious exception is seen in the dormouse, where the cœcum is entirely wanting. The form of the stomach in Rodents is sim-

Fig. 41.



Skull of the Rabbit.

Fig. 42.



Molar Teeth of the Beaver.

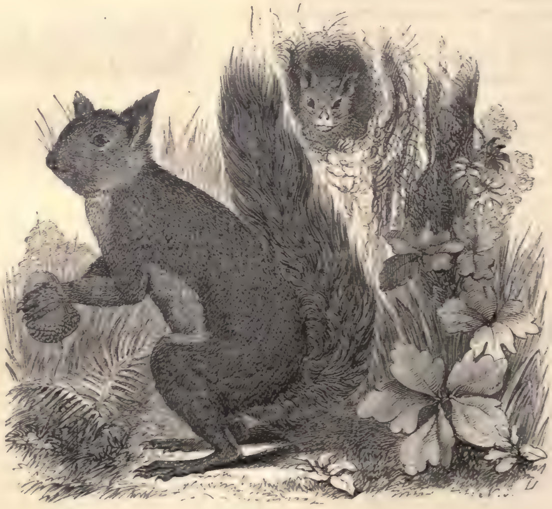
ple. These animals are very prolific, and enjoy a wide geographical distribution, being especially abundant in North America. They are not found in Australia. Fossil remains occur in the tertiary formation.

FAMILY I.—SCIURIDÆ.

The Squirrels have simple tuberculated molar teeth, provided with distinct fangs. These molars are usually eighteen in number, but in some instances there are only fourteen. The incisor teeth are smooth, the lower being much compressed. The feet are generally pentadactylous; exceptions, however, occur in the fore-feet of certain species, where the thumb is merely represented by a warty tubercle. The limbs are either free, or partially invested by alaform membranous expansions of the skin, which materially increase the leaping power of these animals. The tail is well developed, and more or less tufted with long hairs. The species are numerous—so much so, that we can devote only a very short space to their individual consideration.

THE COMMON SQUIRREL (*Sciurus vulgaris*) is a singularly graceful and attractive little animal (fig. 43). Who has not seen it leaping from branch to branch, and clambering up the sides of many a lofty tree? In our woodland districts it is everywhere abundant, and its pretty movements may be most advantageously watched in early spring, when the female, with extreme activity, is pretendingly seeking to evade the pursuit of her attentive lovers, several of which may be giving her chase at one and the same time. "Dwelling principally," observes Mr. Bell, "upon trees, and rarely descending to the ground, it leaps from bough to bough with astonishing agility. It lives upon nuts, acorns, beech-mast, the bark of young trees, leaf-buds, and tender shoots. In eating nuts, it gnaws with considerable rapidity through the hard shell, and then carefully removes every particle of the dry brown skin from each morsel of the kernel before it is eaten. It sits upon its haunches, holding its food in the fore-paws, which serve the office of hands. In taking leaps, when once thrown off by an effort of its long and powerful hinder legs, it is in a measure sustained by the horizontal spreading of its limbs and bushy tail; which latter organ is also extremely useful in covering and protecting the back, over which it is often turned, and in enveloping the whole lateral and dorsal parts of the body when coiled up during sleep or in its hibernation. It lays up stores of food for its winter provision, which is not usually deposited in a single place of safety, but distributed in several different holes of trees, in the immediate neighbourhood of its own retreat. It remains during the greater part of the winter in a state of almost complete torpidity, coming abroad, however, on the occurrence of a fine day, feeding on a part of its treasured hoards, and then retiring again to its slumbers." The general appearance of the squirrel is well known; the length of the body being about fifteen inches, including the tail, which measures six and a half or seven inches. The head is broad, flattened above and at the sides. The eyes are comparatively large, dark-coloured, and prominent. The ears are well developed, and beautifully pencilled at the tip with long delicate hairs. The fur has a rich brownish-red colour generally, being white under the throat and belly. During

Fig. 43



The Squirrel (Sciurus vulgaris).

the winter the fur becomes somewhat lighter, or of a greyish tint. The female produces four or five young at a birth, and rears them in a carefully constructed nest. This is formed of vegetable fibres, moss, leaves, &c., and is usually lodged between the fork of two or more branches, so as to be concealed from view; in some instances the nest is made in the hollow of a tree.

THE HUDSON'S BAY SQUIRREL (*Sciurus Hudsonius*) is found in the white spruce forests of Canada, and the northern parts of the United States. In the latter country it goes by the name of the *Chickaree*, on account of the peculiar loud noise which it makes when disturbed in its favourite haunts. It lives upon the seeds and young buds of the spruce, and makes burrows beneath the roots of this tree, where, during the summer, it lays in a large store of fir-cones as provision for the winter; but it remains active throughout the cold season. The flesh is said to be good eating. The fur has a yellowish-brown hue, the central line of the back having a chestnut tinge; but the colouring varies considerably at different periods of the year.

THE BLACK SQUIRREL (*Sciurus niger*) is a large species measuring upwards of two feet when the tail is taken into account. It is also a North American form, being more particularly abundant on the northern shores of Lake Huron and Lake Superior. According to Sir John Richardson, it is likewise tolerably plentiful in the United States. The fur is short, coarse, and of a deep black colour; the ears have an elliptical form, and are devoid of tufts.

THE GREY SQUIRREL (*Sciurus cinereus*) is an inhabitant of the United States, being common in Pennsylvania and Carolina. Like our English species, it lays up a provision of nuts and acorns against the season of scarcity. This species is particularly destructive to the maize crops, and large numbers are therefore annually destroyed. The grey squirrel is about one-third longer than our form. Its ears are not tufted, and the fur is of an ashy-grey colour generally; underneath the belly, and on the inside of the limbs it is white. The tail is nearly as long as the body.

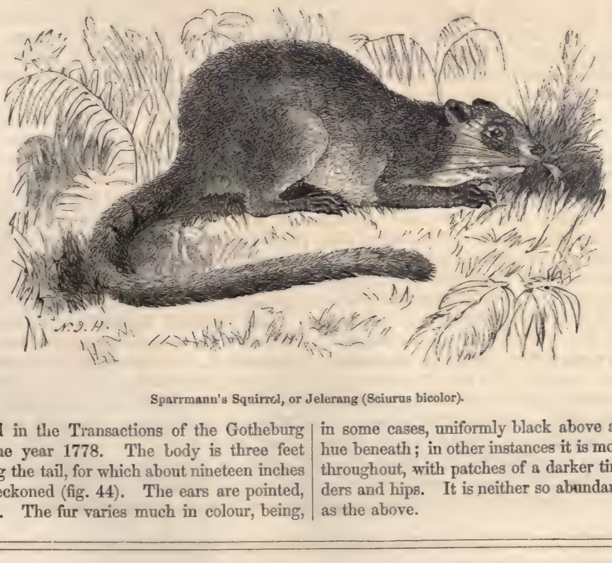
THE WHITE-STRIPED SQUIRREL (*Sciurus getulus*) is a native of the northern parts of Africa, and more particularly of Barbary. The fur exhibits a reddish-grey colour, the sides of the body being banded with two white stripes. It is about the size of our British species, the tail being well developed, and, according to the description given by Pennant, regularly marked with shades of black, one beneath the other. It lives chiefly among palm-trees.

THE MALABAR SQUIRREL (*Sciurus maximus*) is an Indian species, measuring about thirty-three inches, including the tail, which is rather longer than the body. Like the above, it is mostly found among palm-trees, being particularly fond of the cocoa-nut, and the milk which it contains. The fur presents a rich chocolate-brown colour, which subsides into a pale yellowish-brown on the inner sides of the limbs and underneath the belly. The ears are short, and provided with long brush-like tufts.

SMITH'S SQUIRREL (*Sciurus Cepapi*) is a native of Southern Africa, and was originally discovered by Dr. Smith on the banks of the Limpopo river. The fur has an ochreous yellow tint, and is marbled with blackish brown patches. The ears are sharp and blunt above, being also slightly notched near the tip. This species is remarkably shy and agile.

SPARRMANN'S SQUIRREL (*Sciurus bicolor*) is also found in Java, and is, in common with several other species, termed by the natives the *Jelerang*. It is also a native of India and Cochin China. This animal was first described in the Transactions of the Gotheburg Society for the year 1778. The body is three feet long, including the tail, for which about nineteen inches have to be reckoned (fig. 44). The ears are pointed, but not tufted. The fur varies much in colour, being, in some cases, uniformly black above and of a golden hue beneath; in other instances it is more or less tawny throughout, with patches of a darker tint on the shoulders and hips. It is neither so abundant nor so prolific as the above.

Fig. 44.



Sparrmann's Squirrel, or Jelerang (Sciurus bicolor).

THE BOKKUL (*Sciurus insignis*). — This squirrel inhabits Sumatra and Java, where, from the observations of Dr. Horsfield, it would appear to be a very rare species. The fur has a tawny greyish-brown colour generally, becoming ferruginous at the sides, and white beneath the belly; its most characteristic feature consists in the presence of black bands, which pass from the region of the shoulder to the root of the tail. The body, including the last-named organ, is about thirteen inches long. This species, in common with other allied forms found in India and the adjacent islands, possesses a cylindrical tail; the ears are also short and rounded.

THE BAJING (*Sciurus Plantani*) is likewise a Javanese form, and is extremely abundant everywhere in the island. It was first described by Ljung in the twenty-second volume of the Swedish Transactions. The body is seven inches in length, exclusive of the tail, which rather exceeds this measurement. The fur has a beautifully variegated tawny-brown colour; the inner parts of the limbs and the belly being of a lighter yellow. The tail is banded near its root by several dark rings. The Bajing lives principally among the tamarind and cocoa-nut trees. It is readily tamed.

THE PALM SQUIRREL (*Sciurus palmarum*).—This title is applied to several small species which are abundant in India and Africa, and are found most commonly on palm-trees. They commit terrible ravages amongst the fruit, and though much hunted, do not appear to be at all shy. The general ground colour of their fur is reddish-brown, the surface being generally marked with a varying number of bands; the inferior parts of the belly and the inside of the limbs are pale yellow; dark-coloured rings also occur on the tail. The body is about a foot in length from the tip of the nose to the extremity of the last-named appendage.

THE FOUR-BANDED SQUIRREL (*Sciurus quadrivittatus*) is thus named from the circumstance of its displaying four white lines on the back, these being separated from one another by intervening bars of a blackish colour. The sides of the body are reddish-brown, the under parts being lighter coloured. This species inhabits the wooded districts of North America. It is a remarkably lively creature, and when alarmed utters a chirping note, which often proves troublesome to the hunter when in quest of other animals dwelling in the same localities.

THE GROUND SQUIRREL (*Sciurus Lysteri*), or HACKEE, is an elegant little species, characterized by the possession of cheek pouches. It has a brownish-grey fur, subsiding into orange, and becoming white beneath the belly. The sides are also marked by a white band bordered with black, extending from the shoulder to the rump. The tail is comparatively short. The Hackee is a native of North America, being abundant on the shores of Lakes Huron and Superior.

THE ALPINE MARMOT (*Arctomys marmotta*)—Plate 14, fig. 44—is a stout-built animal, about the size of a rabbit, measuring sixteen inches long, excluding the thick-set tail, which gives us six inches more. It inhabits the loftiest slopes of the Alps and Pyrenees, immediately beneath the snow line. The fur has a yellowish-grey colour, becoming brownish-grey about the head. Its food consists of insects, as well as vegetable matters. Its burrows in the earth have three chambers and two outlets, several retreating into the same hole. When alarmed they utter shrill cries, and also on the approach of storms. The female produces three or four young at a birth.

THE POLISH MARMOT (*Arctomys Bobac*), or BOBAC, is an inhabitant of the smaller hills of eastern Europe and Siberia, extending all the way from Poland to Kamtschatka. The fur exhibits a yellowish-grey colour, the hairs about the head having a russet tint. This species corresponds very closely with the preceding in size and general appearance.

THE SOUSLIK (*Spermophilus citellus*) is a native of Austria, Hungary, Bohemia, and Siberia. It is an attractive-looking species, its greyish-brown fur being prettily marked with small white spots. It belongs to the group of marmots possessing cheek pouches. It is said to have a decided liking for animal food, and will occasionally devour its own species.

THE QUEBEC MARMOT (*Arctomys empetra*) is, as the title implies, a native of Canada. In appearance it closely resembles the bobac, whilst its habits are similar to those of its congeners generally. The fur exhibits a hoary aspect, with shades of brown and black intermixed, passing into reddish orange beneath. The tail is about half the length of the body, and black at the extremity.

THE SHORT-TAILED MARMOT (*Arctomys brachyurus*) is an inhabitant of the plains of Columbia, and is characterized by a brownish-grey fur, variegated with red, this colour becoming more conspicuous underneath the belly. The tail is not shorter than that of several allied species. This animal lives in large companies, a single burrow containing ten or twelve occupants. On being disturbed they utter a shrill whistling cry.

PENNANTS' MARMOT (*Arctomys pruinosus*) is described under the title of the WHISTLER by Harmon and Sir John Richardson. It is a large species; a specimen taken on the banks ot the Mackenzie River measuring twenty-seven inches in length. The fur is long, coarse, and of a yellowish-brown colour, the tail being darker and bushy. The Whistler is found occupying the slopes of the Rocky Mountains. The female produces two young at a birth.

THE MARYLAND MARMOT (*Arctomys monax*), or WOOD-CHUCK, is a well-known native of the central districts of the United States, where it is regarded by farmers as a pest, since it proves very destructive to the crops of red clover. The habits of these animals are social and diurnal; for having placed sentinels before their burrows, they wander forth in mid-day to commit their havoc. They are very prolific, the female producing six young at a birth. The fur of the adult has a grey ferruginous colour generally.

THE PRAIRIE MARMOT (*Arctomys latrans*), or WISTONWISH, is another American species, abounding on the banks of the Missouri and its tributaries. The fur is of a reddish-brown colour, the inferior parts being whitish. The tail is short and banded near the tip. When alarmed this creature utters a peculiar barking sound, whence it is often called the prairie dog. Its habits are gregarious, hundreds of them forming a colony, where they construct deep burrows; the entrance to each hole being surrounded by an elevated mound.

Limitation of space prevents our giving full details of the Marmots. Those of our readers, therefore, who desire further information on this head should consult Sir John Richardson's "Fauna Boreali Americana," where they will find a detailed account of the following species of American marmots, unavoidably omitted in this work:—The American Souslik (*Spermophilus guttatus*); the Tawny Marmot (*Arctomys Richardsonii*); the Leopard Marmot (*A. Hoodii*); Say's Marmot (*A. lateralis*); Douglas's Marmot (*A. Douglasii*); Beechey's Marmot (*A. Beecheyi*); Franklin's Marmot (*A. Franklinii*); Parry's Marmot (*A. Parryi*).

In regard to the Squirrels possessing flying membranes, we can only offer the following particulars:—

THE EUROPEAN FLYING SQUIRREL (*Sciuropterus volans*) is only found in the north-eastern parts of our continent, being more abundant in the forests and wild wastes of Siberia. Its habits are similar to those of the common squirrel, feeding, as it does, on the buds of beech-trees and on the seeds contained in fir-cones. During its flying leaps—so much increased in power by membranous expansions of the skin between the fore and hind limbs—the tail is stretched out to aid in steering the body. In a state of repose, this organ is, as usual, gracefully curved over the back.

NIEUHOFF'S FLYING SQUIRREL (*Sciuropterus sagitta*).—This very rare animal—concerning the specific distinctness of which there can be no reasonable doubt—has been carefully described by Pennant. It is a native of Java and other Indian islands, and measures eighteen inches in length, exclusive of the tail, which would give us other fifteen inches. The fur is of a bright bay colour, inclining to orange. During its flying leaps, it is said to employ the tail as a prehensile organ.

THE KECHUBU (*Sciuropterus genibarbis*) is another form of Javanese flying squirrel, measuring, with the tail, about fourteen inches. According to Horsfield it is comparatively rare, and infests the forests of Pugar, one of the most sequestered districts of the eastern portion of Java. Its habits are nocturnal. The fur has a tawny-grey colour generally, the inferior parts being lighter; the texture of the hair is particularly soft and downy.

HORSFIELD'S FLYING SQUIRREL (*Sciuropterus lepidus*) very closely resembles the above, and the distinctions given by Horsfield scarcely seem to warrant its being regarded as a separate species. "It is only found in the closest forests of Java, where the height of the trees and the luxuriance of the foliage effectually conceal it. It is with great difficulty pursued or seized."

THE GREATER FLYING SQUIRREL (*Sciuropterus Sabrinus*)—Plate 14, fig. 43—of North America, is about a foot long, including the tail. The fur has a pale reddish-brown colour generally, being also of very delicate texture. The Rocky Mountain variety so closely resembles it, that, in the opinion of Sir John Richardson, the two kinds ought to be regarded as identical.

THE ASSAPAN (*Pteromys volucella*) is a comparatively small species of flying squirrel. It is very abundant in the United States, infesting the prairies in large troops. Its tail is about one-fourth shorter than the body, and, as in other allied forms, is flat and distichous.

FAMILY II.—MYOXIDÆ.

The Dormice represent a group intermediate between the squirrels and the mice. The molars are sixteen in number, furnished with fangs, and have their crowns marked with transverse ridges of enamel. The feet are pentadactylous, but the fifth toe of the fore-foot is merely represented by a rudimentary tubercle or warty excrescence. The ears are rounded and oval, and the whiskers well developed. The fur is particularly soft and fine. The tail is very long, hairy, and more or less tufted at the extremity. The food of the Dormice consists principally of vegetable matters; but they also devour beetles, and have been known, in a state of confinement, to eat bats, and even their own young.

THE COMMON DORMOUSE (*Myoxus avellanarius*)—Plate 15, fig. 47.—This well-known little animal, with its ruddy yellow fur, is a great favourite with those who delight in domesticated animals—in which condition it is particularly gentle and docile. It is tolerably common throughout Europe, and dwells in the sequestered parts of dense thickets and plantations. During the summer it lays up a store against the winter, when it falls into a drowsy and torpid state; but on warm sun-shiny days it sometimes emerges from its snug retreat or dormitory. Its habits are nocturnal. In the spring the female usually produces four young, which are blind at the time of birth. According to Mr. Bell, a second brood is occasionally brought forth in the early part of autumn.

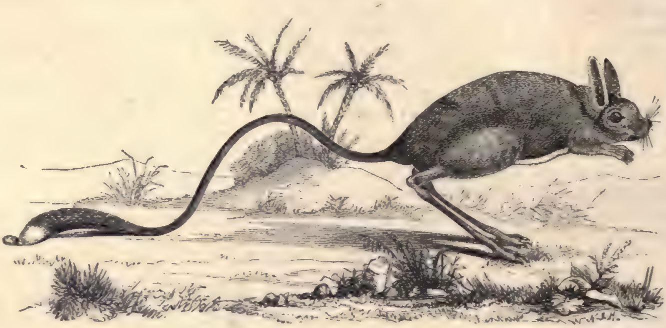
THE GREAT DORMOUSE (*Myoxus Glis*) is an inhabitant of Southern Europe, being also found in Georgia and on the borders of the Wolga. It is about the size of our common rat, and has a pale ash-coloured fur, which is white underneath the belly, and at the inner sides of the limbs; the eyes being surrounded by a dark-brown circle. This animal was, in early times, highly prized as a dainty, and was kept by the ancients and fattened in separate hutches expressly for the table. It is still eaten by the Italians. It nestles in holes of trees and rocks, and sometimes attacks small birds.

FAMILY III.—DIPODIDÆ.

The Jerboas are at once recognized by their remarkably developed hinder extremities, although this peculiarity is also seen in a less striking degree in the marsupial kangaroos. The elongation of the hind limbs eminently fits the members of this family for dwelling amongst wild wastes and open plains; and it is therefore in such localities that they are found. Their molar teeth are complex, and in some instances destitute of roots. The hind feet are tridactylous in the true Jerboas, and tetradactylous in aberrant forms. The clavicles are well developed. The eyes are large; the tail is very long, hairy, and frequently tufted at the tip.

THE ÆGYPTIAN JERBOA (*Dipus Ægyptius*)—Plate 14, fig. 45—is extremely common in the country from whence its name is derived. According to Swainson, it is a sly and timid animal, living in societies, and constructing burrows underground; and is with difficulty preserved in a state of domestication. Some naturalists consider this species as identical with the variety found inhabiting the waste country between the Don and Wolga rivers. and in the southern steppes at the Irtitsch; but the limits of our space prevent our discussing this question or giving further details. The accompanying drawing (fig. 45) represents the Jerboa about to take a leap.

Fig. 45.



The Ægyptian Jerboa (Dipus Ægyptius).

MITCHELL'S JERBOA (*Dipus Mitchellii*) has been so named by Mr. Ogilby after the original discoverer, Sir Thomas Mitchell, who found this species on the marshy grounds near the junction of the Murray and the Murrumbidgee, on the northern boundaries of Australia Felix. In size it scarcely exceeds our common field mouse. The tail is particularly long, and ends in a hairy tuft, two inches in extent.

HARDWICKE'S JERBOA (*Dipus Indicus*), is a native of Hindostan, frequenting the cultivated districts, and proving highly destructive to the wheat and barley crops. It feeds principally on grain, but will in times of scarcity consume other kinds of vegetable food. During its leaps, which extend over a space of four or five yards at a single jump, the tail is stretched out horizontally. At evening time hundreds issue forth from their snug retreats, but they disappear on the slightest alarm.

THE CAPE JERBOA (*Helamys Capensis*)—Plate 14, fig. 46—is a native of South Africa. The hind feet are tetradactylous, and armed with very long, sharply-pointed claws. The ears are largely developed; so is also the tail. The molar teeth have no roots; their crowns also are divided into two equal, oval-shaped portions, by a fold from the outer side in the upper series, and from the inner side below. The fur is of a bright yellow-brown colour generally. The Cape Jerboa is a very powerful animal, leaping as much as thirty feet at a single bound. During sleep it assumes a sitting posture.

THE ALAK-DAARGHA (*Scirtetes jaculus*) is the name given by the Mongols to a species of jerboa inhabiting the steppes between the Donau and the Don; this animal is also found in the Crimea. The feet are pentadactylous, but the three central toes of the hinder extremity are very cogently developed. The molar teeth are rooted, and have their crowns surmounted by contorted ridges of enamel. The ears are fully as long as the head.

FAMILY IV.—MURIDÆ.

The Rats and Mice, properly so called, have largely-developed ears. The clavicles are distinct. There are usually twelve molar teeth, uniformly covered with enamel; and the inferior incisors are compressed and sharply pointed. The fore-feet are tetradactylous, the several digits wide-spread, and the thumb represented by a warty tubercle, which in some cases is clawed; the hind feet are pentadactylous. The skeleton—Plate 33, fig. 106—is comparatively slim throughout. The tail is mostly very long, naked, or only thinly haired. The species are extremely numerous, and abound everywhere.

THE COMMON MOUSE (*Mus musculus*) is almost too well known to require more than a passing notice. The fur exhibits an ashy-brown colour, which becomes lighter underneath the belly. Its ears are about half as long as the head; the tail being rather shorter than the body. This elegant little animal is extraordinarily prolific, the female breeding at all seasons of the year, and usually producing five or six young at a birth. White varieties are very common.

Speaking of the methods adopted for destroying these pests, Mr. Bell remarks as follows:—"In addition to the usual means employed for their extermination, such as traps of various kinds, and the carnivorous instinct of the cat, the ferret, and the weasel, there still exists in Wales a custom so disgustingly cruel that the very mention of it would be scarcely pardonable but for the possibility of thus producing some degree of shame in the perpetrators of it, and consequently saving some poor little mice from being the victims of such barbarity. It is customary in some parts of Wales to roast a mouse alive, hanging it before the fire by its tail tied to a string, that its screams may scare the rest from the house."

As this statement was originally penned some twenty years ago, we indulge the hope that sounder principles of humanity have at length reached the western borders of our isle; and if they have, we shall hail with pleasure any information on this head.

THE HARVEST MOUSE (*Mus messorius*) has a reddish-brown fur above, being white underneath. The ears are comparatively short. The body is only two and a half inches long. The tail is prehensile. This species constructs its nest in the form of a ball, which is suspended amongst rushes, or placed amongst the leaves of some strong wild plant, such as the common thistle. It has been known to devour flies with avidity. Eight or nine young are produced at a single litter.

THE LONG-TAILED FIELD MOUSE (*Mus sylvaticus*) resembles the foregoing in the colouring of the fur, but is distinguished by a brownish spot on the breast, while the ears are much longer, and the tail about the length of the body, including the head. This species proves terribly destructive in our corn-fields; but its diet is not exclusively granivorous, as it has been known to eat young birds, and even its own species. It is rather more than three and a half inches in length, exclusive of the tail.

THE BARBARY MOUSE (*Mus Barbarus*) is an inhabitant of northern Africa. The fur has a dark-brown colour, the sides being prettily marked with five or six yellowish longitudinal bands, which run parallel, and extend from the neck to the rump. Two of the toes on the fore-foot are rudimentary. This species is also known as the Palmetto mouse.

DARWIN'S MOUSE (*Mus Darwinii*) is a native of Coquimbo. It measures rather more than five inches in length, not including the tail. The colour of the fur is a mixture of cinnamon and black, the under parts of the body and the feet being white. The ears are very large and nearly naked. The tail is brownish-black superiorly.

THE BLACK RAT (*Mus Rattus*)—Plate 15, fig. 48—is indigenous in Europe. In this country it is not so abundant as formerly, in consequence of the introduction of the brown species, which persecutes and destroys it. It is chiefly distinguished by the greyish-black fur, and by the tail, which is a little longer than the body. The ears are half as large as the head. Its habits are omnivorous. It increases rapidly, the female producing from seven to nine young at a birth.

THE BROWN RAT (*Mus decumanus*) is also termed the Norway Rat, from an old and erroneous notion that it was indigenous in that country. This is now the common species here, and its destructive habits are only equalled by its boldness and ferocity. It is even more prolific than the above, the female producing as many as twelve or fourteen young at a litter.

THE BANDICOOT RAT (*Mus giganteus*) is a huge species inhabiting India, and measuring thirteen or fourteen inches in length, exclusive of the tail. It is a very mischievous beast, undermining houses and places where stores of grain are kept, and also commits great havoc in gardens, besides sometimes attacking poultry. The low cast Hindoos are very partial to its flesh.

THE TIKUS-WIROK (*Mus setifer*) is a species of rat inhabiting Java. The fur is of a brownish-black colour, and is distinguished by "numerous rigid hairs, which are scattered over the upper parts of the body, and project widely from the general covering." According to Dr. Horsfield, it rarely approaches the dwellings of the natives, and is generally found at the confines of woods and forests.

THE AMERICAN FIELD MOUSE (*Mus leucopus*) may be considered as the representative of our long-tailed *Mus sylvaticus*. Sir John Richardson states that this mouse does considerable mischief in gardens, and will destroy an entire plantation of maize in a few nights. The fur exhibits a bluish-brown colour, being white underneath the belly. Specimens, taken from the Columbia river district, measured four and a quarter inches.

THE LABRADOR JUMPING MOUSE (*Meriones Labradorius*) is very abundant throughout the fur countries. The fur has a liver-brown colour above, becoming yellowish at the sides and underneath. The hind legs are very long, and stouter than those in front. The body is about four and a half inches in length, exclusive of the tail, which measures five and a quarter inches.

THE ROCKY MOUNTAIN RAT (*Neotoma Drummondii*) has a yellowish-brown fur, which is white beneath the belly; but it is principally distinguished by a bushy, hairy tail, in which respect we perceive an approach to the squirrel. It lives in crevices of the higher rocks, its food consisting principally of herbage and the twigs of pine trees. The body measures nine inches, exclusive of the tail, which is still longer.

THE HYDROMYS (*Hydromys leucogaster*).—Two varieties have been described, but they are by some considered to be one and the same species. They have been termed, respectively, the white-bellied and the yellow-bellied Hydromys. They are aquatic animals, about twice as large as an ordinary rat. They have only four molar teeth. The hind feet are pentadactylous; the posterior being semipalmate. The tail is remarkably thick at the root, and only thinly haired. These animals are found at Van Diemen's Land, and other islands off the coast of Australia.

THE HAMSTER (*Cricetus frumentarius*) is a well-known European animal, found in various parts of Russia, Germany, and especially in Thuringia, as well as in Siberia. It lives in subterranean holes, where it hoards up large stores of grain. It is torpid during the winter months. The fur is greyish-yellow above, and black inferiorly, and it is marked by three spots on each side; these marks being sometimes light-coloured, and at other times quite black. The Hamster possesses several pouches, and the tail is very short and hairy. The fore-feet are tetradactylous.

THE PHLŒOMYS (*Phlœomys Cummingii*) is a comparatively large animal from the Philippine islands. The fur has a blackish-brown colour generally, with a reddish tinge on the back. Its length is nearly twenty inches, excluding the tail, which is not so long as the body. The fore-feet are four-toed; the claws being large, compressed, and curved inwards. It was first described by Mr. Waterhouse, in the proceedings of the Zoological Society for the year 1839.

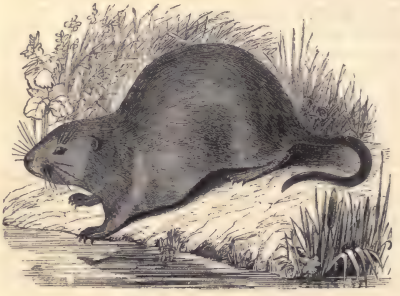
There are many other murine genera and species, for whose consideration we have not sufficient space.

FAMILY V.—ARVICOLIDÆ.

The Swimming Arvicoles or Voles are distinguished from the true mice chiefly by the character of the teeth. The incisors are large, chisel-shaped, and coloured deep yellow in front; the molars have flat crowns presenting enamelled folds, in the form of alternating triangles, on either side. The fore-feet are tetradactylous, with a rudimentary thumb. The muzzle is obtuse, and the ears are not large. The tail is rather short, rounded, and hairy.

THE WATER RAT (*Arvicola amphibia*) has a very close, thick, and shining fur of a rich reddish-brown colour, which becomes paler inferiorly (fig. 46). Its habits are almost too well known to require description. Frequenting the banks of almost every stream, canal, or dyke in this country, it constructs its burrows upwards from the water's edge. "It dives and swims with great facility, instantly seeking the water upon every alarm, and plunging at once to the bottom; from whence, however, it is obliged to return to the surface for respiration about every minute. It has often been asserted that the water vole lives upon small fish, earthworms, and insects, and it has even been accused of destroying young ducks. There is not, however," observes Mr. Bell, "the slightest foundation for this opinion." It feeds on roots and various aquatic plants. The female produces five or six young at a single birth.

Fig. 46.



The Water Rat (Arvicola amphibia).

THE FIELD VOLE (*Arvicola agrestis*), or MEADOW MOUSE, is about four inches in length, exclusive of the tail, which measures rather more than an inch. Its habits are extremely destructive. It feeds on various vegetable matters, grain, &c., and is particularly fond of carrots. It is very prolific, the female producing from five to seven young at a birth. The best method of destroying these pests is by entrapping them in holes excavated in the ground; these pits should be wider below than above.

THE BANK VOLE (*Arvicola riparia*) is, in common with the foregoing, a native of Europe. It is three inches and a quarter long, and the fur is of a bright chestnut red above and greyish beneath. The tail is about half the length of the body. It is not very abundant in Britain, and but little is known respecting its habits.

THE YELLOW-CHEEKED VOLE (*Arvicola xanthognathus*) is an American species, and is abundant in the neighbourhood of Fort Franklin, and also among the Rocky Mountains, especially in localities where the woods have been destroyed by fire. Its habits are similar to those of the common water rat. Length of the body is from five to eight inches. The females produce seven young at a birth.

WILSON'S VOLE (*Arvicola Pennsylvanicus*) is, according to Sir John Richardson, very abundant from Canada to Great Bear Lake. It infests barns and storehouses, where it hoards up grain and seeds of various kinds; it is said also to be very partial to the bulbs of the Philadelphia lily. The body is about three and a half inches long, the fur being brownish and white underneath.

RICHARDSON'S VOLE (*Arvicola borealis*), or NORTHERN MEADOW MOUSE, is about four and a half inches long, exclusive of the short tail, which measures only an inch. Its habits are similar to those of the Yellow-Cheeked species. It is found in abundance on the borders of the Great Bear Lake. The fur has a chestnut tinge mixed with black; under the belly it is greyish.

THE SCANDINAVIAN LEMMING (*Myodes Lemmus*) is about the size of an ordinary rat. The fur is of a ruddy yellow colour, variegated with black. Its proper residence is among the mountains of Norway and Sweden, but it has a remarkable propensity to emigrate at certain periods. Van der Hoeven remarks, that on these occasions multitudes of them "eat everything bare on the road, like locusts. This usually forbodes a hard winter. The number of these animals thus suddenly appearing in situations where they were previously unknown, gave occasion in former times to the strange opinion that they descended from the clouds." It is sometimes called on this account the NORTHERN MOUSE OF PASSAGE.

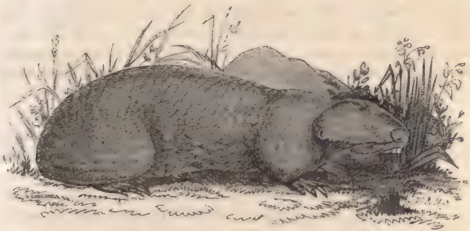
THE GREENLAND LEMMING (*Myodes Greenlandicus*)—Plate 15, fig. 49—was first described by Dr. Traill, from a specimen procured by the distinguished navigator, Captain Scoresby. The body is six and a quarter inches in length, the tail measuring only three-quarters of an inch. There are no external ears. The fore-feet are hairy beneath, the digital claws being rounded and sharply pointed. The central line of the back is marked by a dark band. The muzzle terminates in a sharp nose. The eyes are near each other, and comparatively small.

THE HUDSON'S BAY LEMMING (*Myodes Hudsonius*) is scarcely so large as the preceding, and, according to Richardson, is distinguished by the two central claws of the fore-feet being unusually large; they are likewise compressed, "their very blunt extremity being rendered double by a deep transverse notch." Although this species is very easily tamed, very little is known respecting its habits.

BACK'S LEMMING (*Myodes trimucronatus*) inhabits the wooded districts of North America, and is named after Captain Back, who first discovered it on the banks of Point Lake. Sir John Richardson states, that "in the winter it travels under the snow in a semi-cylindrical furrow, very neatly cut to the depth of two inches and a half in the mossy turf. These hollow ways cross each other at various angles, but occasionally run to a considerable distance in a straight direction. From their smoothness, it was evident that they were not merely worn by the feet, but actually cut by the teeth." The muzzle of this species is blunt, and the nose of a black colour; the fur has a chestnut hue, being greyish underneath.

THE SLEPEZ (*Spalax typhlus*), or **BLIND MOLE-RAT**, is a very singular animal (fig. 47). It is also known by the names of Podolian Marmot, Zemni, and *Sfochor Nomon*, the latter name being that employed by the Cossacks. It is characterized by the presence of large incisor teeth, and twelve complex molars. The head is even broader than the body, flat on the crown, and truncated in front. There are no ears; whilst the eyes are almost rudimentary, being represented by tiny specks partly concealed by the fur. The limbs and feet are short, and armed with small claws. The fur is soft, dense, and of an ashy-grey colour, inclining to red. This animal, observes Mr. Broderip, "burrows extensively beneath the turf, driving at intervals lateral passages in its search for roots, particularly that of the bulbous *Chærophyllum*. Openings to the surface occur at distances of some yards from each other, and there the earth is raised into hillocks, sometimes of two yards in circumference, and of considerable height. It works stoutly and rapidly, and on the approach of an enemy instantly digs a perpendicular burrow. Though it cannot see, it lifts its head in a menacing attitude towards its assailant, and when irritated snorts and gnashes its teeth, but emits no cry; its bite is very severe. In the morning it often quits its hole, and during the season of love basks in the sun with the female." According to a popular superstition in the Ukraine, any one who has squeezed this animal to death in his hand, and who has been bitten by it in so doing, has conferred on himself the power of curing goitre by merely touching those who are suffering from this disease. The Slepez is about eight inches in length.

Fig. 47.



The Slepez or Blind Mole-rat (Spalax typhlus).

FAMILY VI.—CASTORIDÆ.

The Beavers are readily distinguished from all other Rodents by their flattened scaly tail, which in the typical species has an oval outline. The molar teeth are twelve in number; they have flattened crowns, the inner border of the upper series being marked by a single enamelled fold, and the outer by three folds; this complicated arrangement is reversed in the lower series (fig. 42). The feet are pentadactylous, the digits of the hinder feet being clothed at the margins by long hairs. The tail is more than half the length of the body, being double-edged towards the free end, and covered throughout with scales and short hairs. The habits of the beavers are aquatic. Fossil remains of several species have been found in various parts of Europe; some of those obtained from the crag deposits in Norfolk and Suffolk differing in several respects from the skeletons of those now living, and being, in the view of Professor Owen, clearly distinctive of a much larger species. There can be no doubt, however, that the Beaver, which, though scarce, is still living in Europe, formerly abounded in Great Britain; and there is every reason to believe that it is identical with the American species, which we have now to describe.

THE COMMON BEAVER (*Castor fiber*)—Plate 15, fig. 50.—This well-known animal is one of the largest, and at the same time the most interesting of all the Rodents, and consequently demands at our hands a more lengthened consideration than any of the foregoing. The body measures nearly three and a half feet in length, exclusive of the tail, which would give another eleven or twelve inches. Ordinarily the fur has a rich reddish-brown colour; though in some cases it is spotted, in others black, and in a third rare variety quite white. In Europe the Beaver occurs sparingly along the banks of the Rhone, the Danube, and the Weser; but in the northern districts of Canada it is still very abundant in places. At one time such were the multitudes destroyed annually, that it was feared this useful animal would become totally extinct. To prevent this, however, the furriers of the Hudson's Bay Company and certain Indian tribes, have adopted arrangements by which a moderate supply of furs will always be forthcoming, for the manufacture of hats and other articles. The most interesting circumstance in the history of these animals is the extraordinary skill they display in the construction of their dams and dwellings. Many excellent records of their habits, in this particular, have from time to time appeared; but for minuteness and accuracy of detail none have equalled the account given by the traveller Hearne in his "Journey to the Northern Ocean." We shall, therefore, record his observations *in extenso*, which are as follows:—"Where the beavers are numerous, they are found to inhabit lakes, ponds, and rivers, as well as those narrow creeks which connect the numerous lakes with which this country abounds; but the two latter are generally chosen by them, when the depth of water and other circumstances are suitable, as they have then the advantage of a current to convey wood and other necessaries to their habitations, and because in general they are more difficult to be taken than those that are built in standing water. They always choose those parts that have such a depth of water as will resist the frost in winter, and prevent it from freezing to the bottom. The beavers that build their houses in small rivers and creeks, in which water is liable to be drained off when the back supplies are dried up by the frost, are wonderfully taught by instinct to provide against that evil by making a dam quite across the river, at a convenient distance from their houses. The beaver dams differ in shape according to the nature of the place in which they are built. If the water in the river or creek have but little motion, the dam is almost straight; but when the current is more rapid, it is always made with a considerable curve, convex towards the stream. The materials made use of are driftwood, green willows, birch, and poplars, if they can be got; also, mud and stones intermixed in such a manner as must evidently contribute to the strength of the dam; but there is no other order or method observed in the dams, except that of the work being carried on with a regular sweep, and all the parts being made of equal strength. In places which have been long frequented by beavers undisturbed, their dams by frequent repairing become a solid bank, capable of resisting a strong force both of water and ice; and as the willow, poplar, and birch generally take root and shoot up, they by degrees form a regular kind of planted hedge, which I have seen in some places so tall that birds have built their nests among the branches. The beaver houses are built of the same materials as their dams, and are always proportioned in size to the number of inhabitants, which seldom exceeds four old and six or eight young ones; though by chance I have seen above double that number. Instead of order or regulation being observed in rearing their houses, they are of much ruder structure than their dams; for, notwithstanding the sagacity of these animals, it has never been observed that they aim at any other convenience in their houses than to have a dry place to lie on; and there they usually eat their victuals, which they occasionally take out of the water. It frequently happens that some of the large houses are found to have one or more partitions, if they deserve that appellation; but it is no more than a part of the main building, left by the sagacity of the beaver to support the roof. On such occasions it is common for those different apartments, as some are pleased to call them, to have no communication with each other but by water; so that, in fact, they may be called double or treble houses, rather than different apartments of the same house. I have seen a large beaver house built in a small island, that had near a dozen apartments under one roof; and, two or three of these only excepted, none of them had any communication with each other but by water. As there were beavers enough to inhabit each apartment, it is more probable that each family knew their own, and always entered at their own doors, without any further connection with their neighbours than a friendly intercourse, and to join their united labours in erecting their separate habitations, and building their dams where required. Travellers who assert that the beavers have two doors to their houses, one on the land side and the other next the water, seem to be less acquainted with these animals than those who assign to them an elegant suite of apartments. Such a construction would render their houses of no use, either to protect them from their enemies or guard them against the extreme cold of winter. So far are the beavers from driving stakes into the ground when building their houses, that they lay most of the wood crossways and nearly horizontal, and without any other order than that of leaving a hollow or cavity in the middle. When any unnecessary branches project inward they cut them off with their teeth, and throw them in among the rest to prevent the mud from falling through the roof. It is a mistaken notion that the wood-work is first completed and then plastered; for the whole of their houses, as well as their dams, are from the foundation one mass of mud and wood mixed with stones, if they can be procured. The mud is always taken from the edge of the bank, or the bottom of the creek or pond, near the door of the house; and though their fore-paws are small, yet it is held so close up between them under their throat that they carry both mud and stones, while they always drag the wood with their teeth. All their work is executed in the night; and they are so expeditious that in the course of one night I have known them to have collected as much mud as amounted to some thousands of their little handfuls. It is a great piece of policy in these animals to cover the outside of their houses every fall with fresh mud, and as late as possible in the autumn, even when the frost becomes pretty severe; as by this means it soon freezes as hard as a stone, and prevents their common enemy, the wolverene, from disturbing them during the winter. And as they are frequently seen to walk over them, and sometimes to give a flap with their tail, particularly when plunging into the water, this has, without doubt, given rise to the vulgar opinion that they used their tails as a trowel with which they plaster their houses; whereas that flapping of the tail is no more than a custom which they always preserve even when they become tame and domestic, and more particularly so when they are startled. Their food consists of a large root, something resembling a cabbage stalk, which grows at the bottom of the lakes and rivers (the plant being, according to Sir John Richardson, the yellow water lily, *Nuphar luteum*). They also eat the bark of trees, particularly those of the poplar, birch, and willow; but, the ice preventing them from getting to the land in the winter, they have not any barks to feed on during that season, except that of such sticks as they cut down in summer, and throw into the water opposite the doors of their houses; and as they generally eat a great deal, the roots above mentioned constitute a principal part of their food during the winter. In summer they vary their diet by eating various kinds of herbage, and such berries as grow near their haunts during that season. When the ice breaks up in the spring the Beavers always leave their houses, and rove about until little before the fall of the leaf, when they return again to their old habitations, and lay in their winter stock of wood. They seldom begin to repair the houses till the frost commences, and never finish the outer coat till the cold is pretty severe, as hath been already mentioned. When they erect a new habitation they begin felling the wood early in summer, but seldom begin to build until the middle or latter end of August, and never complete it till the cold weather be set in." Further on our author remarks, that "in respect to the Beavers dunging in their houses, as some persons assert, it is quite wrong, as they always plunge into water to do it. I am the better enabled to make this assertion from having kept several of them till they became so domesticated as to answer to their name and follow those to whom they were accustomed, in the same manner as a dog would do, and they were as much pleased at being fondled as any animal I ever saw. In cold weather they were kept in my own sitting-room, where they were the constant companions of the Indian women and children, and were so fond of their company, that when the Indians were absent for any considerable time, the Beavers displayed great signs of uneasiness; and on their return showed equal marks of pleasure by fondling on them, crawling into their laps, lying on their backs, sitting erect like a squirrel, and behaving like children who see their parents but seldom. In general, during the winter, they lived on the same food as the women did, and were remarkably fond of rice and plum-pudding. They would eat partridges and fresh venison very freely, but I never tried them with fish, though I have heard they will at times prey on them." The flesh of the beaver is considered to be a luxury by the Indians, especially if roasted with the skin on. Sir John Richardson says that its flavour is like that of pork, and that it sits heavy on the stomach, requiring strong digestive powers for its assimilation. The female beaver is provided with eight teats, and usually produces about the middle or towards the end of May a litter of from four to eight or even nine young. The voice of the cub resembles the cry of an infant.

THE MUSQUASH (*Castor zebethicus*), MUSK-RAT, or ONDATRA, is a small kind of beaver, having a strong musky odour, which some consider to be pleasant. The body is fourteen inches in length, exclusive of the tail, which measures about nine inches. The hind feet are not webbed. The fur has a ruddy-brown colour generally, being darker on the head and along the central line of the back. The tail is flattish, rounded at the sides, and blunt at the extremity. The Musquash inhabits marshes and lakes, and the grassy banks of sluggish rivers in North America, between the latitudes of thirty and sixty-nine degrees. It feeds chiefly on vegetable matters, but it would appear to be very partial to fresh-water mussels. These animals construct huts on a small scale, somewhat after the fashion of their more powerful congeners, the huts being of simple construction and proportionately small; the interior is lined with dry grass, the aperture of access being under the water. They are much hunted by the Indians, who spear them whilst they are snugly ensconced within their humble dwellings. Several hundred thousand skins are annually imported into England.

THE COYPU (*Myopotamus Coypus*)—Plate 16, fig. 51—is by some naturalists placed among the *Hystricidæ*, but in the arrangement and character of its teeth it corresponds with the beavers. The tail, however, is not compressed, but rounded and hairy; while the fifth toe of the hind feet projects beyond the web-like membrane which conjoins the remaining toes. The fur has a dusky-brown colour generally, the tip of the muzzle and chin being whitish; whilst a yellow patch occurs on either side of the head immediately beneath the opening of the ear. The Coypu, which is nearly as large as the common beaver, is an inhabitant of the rivers and streams of South America, on both sides of the Andes. It is not exclusively confined to freshwater lakes and streams, for Mr. Darwin states that it is abundant in the Chonas Archipelago, living in the bays and channels formed by the small and numerous islands of that group. Like the musquash, it appears to be fond of shell-fish. The flesh is said to be excellent eating. By the South American traders the furs are sold under the title of otter skins, several hundred thousand being annually imported into Europe.

FAMILY VII.—HYSTRICIDÆ.

The Porcupines are readily distinguished by the possession of stiff, rigid bristles or quills, similar to those found in the Hedgehogs; their characteristic rodent incisors, however, at once showing the order with which they are properly associated. The molar teeth are sixteen in number; they have flat crowns, marked by undulating lines of enamel, transversely disposed and slightly raised above the dentine. The tongue is rough and armed with horny scales. They have fourteen ribs. The clavicles are almost fully developed, being articulated to the sternum, but only loosely connected to the scapula by ligamentous bands. They have five toes behind, the anterior feet being tetradactylous, and the rudimentary thumb merely represented by a warty tubercle. The Porcupines inhabit the warmer regions, both of the eastern and western hemispheres. They live in burrows, emerging only to feed upon roots, young shoots of shrubs and trees, as well as bark and various kinds of fruit.

THE COMMON PORCUPINE (*Histrix cristata*)—Plate 16, fig. 52—is an inhabitant of Southern Europe and Northern Africa, being, in the former continent, found in Italy, Sicily, and Spain. The body is about two feet long, including the short tail; its colour is grizzled or variegated, owing to the alternating shades of white, brown, and black with which the quills are marked. On the back of the head, the neck, and on the hinder parts, the quills are represented by stiff bristly hairs; those on the tail form hollow horny tubes suspended by slender stalks, which, though originally closed at the ends, become subsequently opened by continual use—the animal delighting to shake them together with the view of creating a peculiar rattling sound. The longest spines are considerably thicker than an ordinary goose quill, and are upwards of twelve inches in length. The habits of the Porcupine are nocturnal, and its food consists of vegetable matters, such as roots, fruits, young shoots, and leaves. During the coldest winter months it hybernates for a short period, retreating within its capacious burrow, which has generally two or more apertures of ingress. Finally, it is almost superfluous to remark, that this animal has no power of shooting its quills, as some have imagined.

THE CANADA PORCUPINE (*Histrix pilosa*) has a tolerably wide distribution in North America, being found between the latitudes of thirty-seven and sixty-seven degrees. It has been known from the earliest times, and has the credit of being a remarkably sluggish animal. It makes its burrow chiefly among the roots of old trees, and is most abundant in sandy districts, where it feeds upon the bark of the banksian pine and other conifers. On being disturbed, it utters a whining cry. From the observations of Sir John Richardson, it would seem that this species has the power of detaching its quills! "It is readily attacked," he says, "by Indian dogs, and soon killed, but not without injury to its assailants, for its quills, which it erects when attacked, are rough, with minute teeth directed backwards, that have the effect of rendering this seemingly weak and flexible weapon a very dangerous one. Their points, which are pretty sharp, have no sooner insinuated themselves into the skin of an assailant than they gradually bury themselves, and travel onwards until they cause death by wounding some vital organ. These spines, which are detached from the porcupine by the slightest touch, and probably by the will of the animal, soon fill the mouths of the dogs which worry it, and unless the Indian women carefully pick them out, seldom fail to kill them. Wolves occasionally die from the same cause." The flesh of this porcupine is coarse, but appears to be enjoyed by the Indians. The female produces two young at a birth, usually towards the latter part of the spring. The fur has a liver-brown colour, the spines being more or less white.

THE BRAZILIAN PORCUPINE (*Synetheres prehensilis*), or COENDOU, is a native of Guiana, and bears a general resemblance to the above, especially in its habits, which are nocturnal. It is peculiar, however, in presenting a long prehensile tail, which is thinly haired and annulated towards the free extremity. The hind feet are tetradactylous. Like the Canadian species its movements are very sluggish; but it is materially assisted in climbing trees by its tail, which organ is even more usefully employed during its downward progress; it is also no less than eighteen inches in length. The coendou is further characterized by a short abrupt muzzle armed with long white whiskers.

THE JAVANESE PORCUPINE (*Hystrix fasiculata*) is a small species measuring little more than a foot in length, while the tail would add only another four or five inches. This organ has very few hairs on it, their place being supplied by flat blackish scales, arranged in the form of rings; at the tip, however, there is a tuft of long flat bristles, bearing, as remarked by Buffon, a resemblance to narrow slips of parchment cut in an irregular manner, the tuft being about two inches long, and of a white colour. The general colour of the body is that of a dusky-brown. Its habits are like those of its congeners. When irritated it bristles up its spines, and looks capable of resisting almost any enemy. It is not confined to Java, but is found on the Malayan peninsula, and on most of the islands of the Indian Archipelago.

There are many other Rodent forms which have been grouped together into various subfamilies. Of these we need only mention the genera *Cercolabes*, *Æchimys*, *Capromys*, *Aulacodus*, *Loncheres*, and *Cercomys*, which are pretty closely allied. The genera *Orycterus* and *Bathiergus* are associated together in Dr. J. E. Gray's arrangement — under the family ASPALACIDÆ—the last-named genus being represented by several interesting species. Among these may be mentioned—

THE SHORE MOLE (*Bathiergus maritimus*), which is a native of Southern Africa. It is provided with very large incisors, the upper ones being grooved longitudinally. This peculiarity is not found in those members of the family occupying the sand-hills of the interior. All of the species, however, possess sixteen molars, which have the crowns divided by a transverse line of enamel. They have no ears, very small eyes, and short tails. The fore-feet are furnished with strong fossorial claws, that of the second digit being particularly large. They feed principally on roots.

FAMILY VIII.—OCTODONTIDÆ.

The species included under this head have no true roots to their molar teeth; these organs usually display only a single fold of enamel on either side of their flattened crowns, but in a few instances a second fold is observable on the inside of the lower series. The hind feet are in most cases pentadactylous, but in some tetradactylous. The members of this family, though of small bulk, are comparatively strong, and well adapted for burrowing under ground. They are found in the South American continent, especially in the central and more southern districts. With few exceptions, the whole structure of their skeleton, the form of their skull, and the stout fore-limbs, armed with powerful claws, demonstrate their adaptability to a subterraneous mode of existence.

CUMING'S OCTODON (*Octodon degus*), is a native of Chili, and is sometimes called the CHILIAN SQUIRREL, from the habit it has of scrambling up bushes and low brushwood. The fur has a brownish-yellow colour generally, and is very pale underneath. The ears are conspicuous, rounded, and thinly haired. The thumbs of the fore-feet are only feebly developed; while the claws of all the toes are somewhat concealed by the hair, especially those of the hind feet. The food of these animals consists mostly of herbage, but in times of scarcity they feed upon the bark of species of *mimosa* and *cestrum*. Mr. Darwin states that they may be seen by hundreds in the hedgerows and thickets of central Chili, and that their numerous burrows freely intercommunicate. Their habits resemble those of rabbits, and they prove very destructive to fields of young corn; when disturbed while feeding, they scamper off to the hedgerows with their tails uplifted.

THE SCHIZODON (*Schizodon fuscus*) inhabits the eastern slopes of the southern Andes. The fur has a deep brown colour above, while it exhibits a pale yellowish tint below. This animal was first discovered by Mr. Bridges, who found it in the Valle de las Cuevas, at a height from between five to seven thousand feet above the level of the sea. Its habits are nocturnal, but it seldom comes out of its burrows, which are by preference made in grassy swamps, near to small mountain streams.

POPPIG'S SPALACOPUS (*Spalacopus noctivagus*) is also an inhabitant of Chili, possessing habits very similar to the above. The fur is glossy, and displays a rich purple-brown and blackish tint. The incisors are smooth and of a pale yellow colour in front. The molars are so uniformly indented on either side, that each resembles a figure of eight. The ears are very small, the tail being particularly short. The claws of the feet are compressed and curved inwards; those of the fore-feet are rather shorter than the toes.

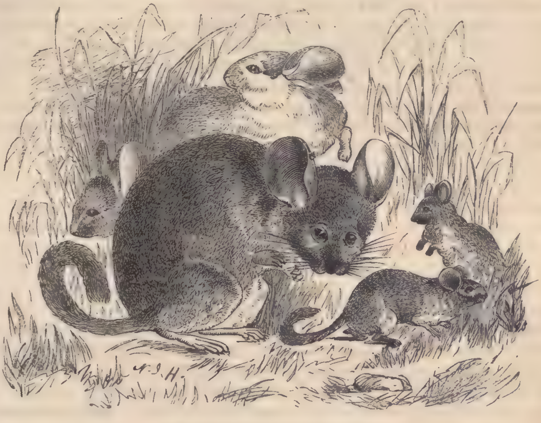
BENNETT'S HABROCOME (*Habrocoma Bennettii*) and another species—*H. Cuvieri*—constitute a distinct genus, which in the structure of the skeleton, approaches very closely to the Chinchillas. The auditory *bullæ* are remarkably large, while there are no less than seventeen pairs of ribs. The incisor teeth are narrow; the crowns of the superior molars have a single fold internally, those of the lower being angular in form and directed obliquely forward. These animals have rather large and thinly-haired ears. The whiskers are particularly long. The feet are four-toed, and the tail is moderately developed. The fur is very soft and thick.

THE BRAZILIAN CTENOMYS (*Ctenomys Braziliensis*) is an inhabitant of the continent from whence it owes its specific name, and also of La Plata, Paraguay, and Bolivia. The molar teeth are simple, decreasing in size from before backwards; the last has a semi-cylindrical form, that of the upper series being obliquely lunated, with the concavity directed outwards, whilst that of the lower group is oval. The eyes are small, the ears only rudimentary; the tail being rather short and covered with adpressed hairs. The fore-feet are furnished with powerful claws, at the base of which are numerous strong bristle-like hairs directed inwards. Its habits resemble those of the family generally. Several other species are known.

Family IX.—CHINCHILLIDÆ.

The Chinchillas are closely allied to the previous family, having four rootless molars on either side of each jaw, and simple, smooth incisors; the molar teeth being made up of narrow, parallel plates of dentine, transversely disposed and surrounded by enamel. In addition to these characteristic marks, the Chinchillas have their posterior limbs nearly twice as long as the anterior pair. The tail is also much developed, and tufted with long bristly hairs at the extremity. The ears are remarkably large, the internal auditory *bullæ* being also extensively developed. The clavicles are well formed. The Chinchillas are natives of the South American continent.

Fig. 48.



The Chinchilla (Chinchilla lanigera).

THE CHINCHILLA (*Chinchilla lanigera*) measures about nine inches long, exclusive of the tail, which would add some five or six inches more. The fur has an ashy-grey colour generally, being much paler underneath. The eyes are large and full, while the broad ears are particularly attractive; the whiskers are correspondingly extensive (fig. 48). The anterior feet are pentadactylous, the internal toe or thumb being very small; the posterior feet have only four digits. The fur is beautifully soft and delicate, and consequently fetches a comparatively high price; multitudes being destroyed annually for the purposes of sale, &c. In regard to its habits, the best account that we have is that given by the Italian naturalist, Molina. "This little animal," he says, "lives in burrows under ground, in the open country in the northern provinces of Chili, and is very fond of being in company with others of its species. It feeds upon the roots of various bulbous plants, which grow abundantly in those parts; and produces twice a year five or six young ones. It is so docile and mild in temper, that if taken into the hands it neither bites nor tries to escape, but seems to take a pleasure in being caressed. If placed in the bosom, it remains there as still and quiet as if it were in its own nest. This extraordinary placidity may possibly be rather due to its pusillanimity, which renders it extremely timid. As it is in itself peculiarly cleanly, there can be no fear of its soiling the clothes of those who handle it, or of its communicating any bad smell to them, for it is entirely free from that ill odour which characterizes the other species of rats. For this reason it might well be kept in houses without annoyance and at a trifling expense, which would be abundantly repaid by the profits on its wool. The ancient Peruvians, who were far more industrious than the modern, made coverlets for beds and valuable stuffs out of this fur." The Chinchillas are fortunately extremely prolific, otherwise they would have been extinct long ago. A female preserved in the Zoological Society's Gardens, Regent's Park, produced seven young ones at a single litter. From eighty to a hundred thousand skins are annually imported into this country.

THE CHINCHA (*Lagotis Cuvieri*) is about the size of an ordinary rabbit, possessing long ears and a greyish-coloured fur. All the feet are tetradactylous, the digits being furnished with rather small claws; each molar tooth is made up of three laminæ; the whiskers are very long, some ten or twelve of the bristles being particularly stout. This animal lives on the western slopes of the Andes, and has often been confounded with the viscacha, from which, however, it is quite distinct. According to Ulloa's observations, as quoted by Mr. Bennett, the CHINCHAS "conceal themselves in holes of the rocks, in which they make their retreats, not forming burrows in the earth, like rabbits. There they congregate in considerable numbers, and are mostly seen in a sitting posture, but not eating; they feed on the herbs and shrubs that grow among the rocks, and are very active. Their means of escape do not consist in the velocity of their flight, but in the promptitude with which they run to the shelter of their holes. This they commonly do when wounded, for which reason the mode of killing is by shooting them in the head." There is a second species, the *Lagotis pallipes* of Bennett, which closely resembles its fellow. One remarkable peculiarity possessed by these animals consists in the caducous character of their fur; this immediately after death, falls off on the slightest touch, so that, in an economic point of view, the skin is rendered almost valueless.

THE VISCACHA (*Lagostomus trichodactylus*) is also known by the names of BISCACHO and MARMOT DIANA. It lives on the eastern declivities of the Andes, and is quite distinct from the chincha, which occupies the western slopes of the same chain of mountains. Various interesting accounts of the habits of this species have been given by different writers, and more particularly by Darwin, Bennett, and Dobrizhoffer. These records are in general very similar, though differing in a few particulars. Mr. Darwin states that in the evening the Viscachas come out of their holes "in great numbers, and there sit quietly on their haunches. They are, at such times, very tame, and a man on horseback passing by, seems only to present an object for their grave contemplation. They do not wander far from their burrows. They run very awkwardly, and when hurrying out of danger, from their elevated tails and short front legs, much resemble great rats. Their flesh when cooked is very white and good, but it is seldom used. The Viscacha has one very singular habit, namely, dragging every hard object to the mouth of its burrow. Around each group of holes many bones of cattle, stones, thistle-stalks, hard clumps of earth, dry dung, &c., are collected into a heap, which frequently amounts to as much as a wheelbarrow would contain. I was credibly informed," adds Mr. Darwin, "that a gentleman, when riding in a dark night, dropped his watch; he returned in the morning, and by searching in the neighbourhood of every viscacha-hole on the line of road, as he expected, soon found it. This habit of picking up whatever may be lying on the ground anywhere near its habitation, must cost much trouble. For what purpose it is done I am unable to form the most remote conjecture; it cannot be for defence, because the rubbish is chiefly placed above the mouth of the burrow, which enters the ground at a very small inclination." The fur of the Viscacha has a greyish-dusky colour, the tail is brownish-black, and the face is marked with several black and white bands.

FAMILY X.—CAVIDÆ.

The members of this family, as we propose to retain them, may be fairly subdivided into two minor groups—namely, those which have rooted grinders, and those whose molars are rootless. Some have separated them into two distinct families; but in most particulars they are very closely allied. The molars are sixteen in number, being more or less complicated by laminar plates. The front feet are either three or four-toed, the hind feet being generally tridactylous, and in some cases pentadactylous, with the two outer digits feebly developed. The claws are strong, compressed, and arched. The Cavies are all inhabitants of the South American continent. Their bodies are clothed with short hair; the ears are moderately developed, whilst the tail is either very small or altogether wanting.

THE PATAGONIAN CAVY (*Dolichotis Patagonica*) frequents the desert wastes of the southernmost parts of America, extending as far north as La Plata. It is considerably larger than our common hare, a full-grown example weighing as much sometimes as thirty pounds. The fur presents a mixture of grey and rust colour, the under parts of the head, neck, and belly being white. The molars have no roots; the incisors being smooth and nearly white. The fore-feet are four-toed; the hinder ones, three-toed. The large ears are broad at the base, and more than half the length of the head. The legs are high—a feature by which it ought to be readily distinguished from the hare, but is generally overlooked by uninformed travellers. In regard to its habits, it is, like its congeners, fond of burrowing, and, according to Mr. Darwin, "when found in the same districts with the viscacha, it will avail itself of the excavations of this little animal for a retreat. The Patagonian Cavies wander at times to great distances from their homes, and usually two or three are seen together on these occasions. The animal in its mode of running more nearly resembles the rabbit than the hare, and though its limbs are long it does not run very fast. It seldom squats after the manner of the hare, is very shy and watchful, and feeds by day." The female produces two young at a birth.

THE ROCK CAVY (*Cavia rupestris*) is a native of the rocky districts of Brazil generally. It is likewise found abundant in the higher regions bordering the Rio Pardo and Rio de St. Francisco. It is a taller species than the above, and is remarkable as having the nails of the toes blunt, and so small that they scarcely project beyond the large digital toe-pads with which the feet are also supplied. It has no tail, and the ears are shorter than one half of the head. The flesh is considered good eating.

THE RESTLESS CAVY (*Cavia aperca*) is generally considered to be the originator of our domestic variety of cavy, commonly called the guinea-pig. It is an inhabitant of Brazil, and is found in Paraguay and La Plata. The hairs are brown, with reddish-yellow points, the throat and inferior parts being either white, greyish, or dirty yellow. In the tame varieties the prevailing tint is white, with black and orange-coloured spots. According to Dr. Rengger, this species lives wild, in little societies, varying numerically from six to fifteen individuals. Its principal feeding time is in the morning and evening. In respect of its procreative powers in the domesticated state, few animals surpass it. The female produces from six to twelve young at a litter, and this frequently takes place several times during the year. In six or eight weeks the young are themselves ready to give birth to other offspring.

THE BOLIVIAN CAVY (*Cavia Boliviensis*) occupies only the higher altitudes of Bolivia. The fur has a greyish-yellow colour, being whitish underneath. The incisors have an orange yellow tint. This species is very shy, and, from the statement of Meyen, is believed to be extremely abundant on the lofty plains of Tarna and Tajari. Several other species of cavy are found in Brazil and different regions of South America.

THE CAPYBARA (*Hydrochœrus Capybara*) inhabits the banks of almost every river in Brazil, Guiana, and Paraguay, being also found more or less abundant throughout the whole continent of South America. This is the largest species of rodent now existing, the body attaining sometimes a length of four feet. The superior incisors are grooved longitudinally in front. The molars are made up of numerous laminæ, and they are so disposed in the posterior teeth, that Cuvier was led to indicate an affinity on the part of this animal with the elephant—a view which enjoys the sanction of the best comparative anatomists. The head of the Capabara is long, thick, and drawn out towards the muzzle. The feet are slightly palmated; the digits being armed with broad ungular claws. The skin is clothed with long, thin, and scanty hairs; constituting another feature which serves to remind us of the pachydermatous mammals. There is no trace of a tail. According to Marcgrave, as recorded by Broderip, this aberrant rodent lives on herbs and fruits. It is a nocturnal animal, swimming across rivers and torrents in search of food, and raising a horrible noise on such occasions. Multitudes of them congregate together on the banks of streams, where they are attacked and destroyed by hunters before they can plunge into the water. Those, however, which succeed in getting into the stream are safe; for though slow of foot, they are expert swimmers. Some writers aver that they are fond of fish; but this seems doubtful.

THE PACA (*Cœlogenys Paca*) is a moderately large South American rodent, measuring about two feet in length, and like the foregoing presents some affinities with the pachyderms. The general colour of the fur is dark-brown above and white underneath; the sides being prettily marked with four or five longitudinal rows of white spots, extending backwards from the shoulder to the rump. The Paca is furnished with buccal pouches; the upper lip is cleft, and there is a large fold of integument on the cheeks. The tail is very feebly developed. The fore-feet are tetradactylous, a rudimentary thumb existing in the form of a clawed warty tubercle; the hind feet are three-toed. The Paca frequents low forests in the neighbourhood of water. It forms burrows which are comparatively superficial, and have three openings. Though heavy-looking and stout-built, it is tolerably swift on foot. Its habits are nocturnal, feeding on fruits and herbage. The female produces a single young one at a birth. The flesh is excellent eating.

THE AGOUTI (*Dasyprocta Aguti*).—The several species of the genus which this animal represents are characterized by tetradactylous feet in front, and tridactylous feet behind, and in this particular they correspond with the paca. This rodent is about the size of a hare, and, as a kind of game, seems to supply the place of our "puss" in Brazil, where it is much hunted. The general colour of the fur is yellowish-brown; a mottled or speckled appearance being produced by the hairs in the region of the neck from accumulations of brown, yellow, and black colour. The Agoutis do not construct burrows, but frequent thickets, and when pursued generally seek for holes under old trees, or any place calculated to afford a semblance of security. When captured they utter a plaintive cry, and offer little or no resistance. Their claws being blunt and straight, they are unable to clamber up the trees. These animals are very prolific, the female bringing forth several young at a single birth. Many other species occur in Brazil and the adjoining West Indian islands.

FAMILY XI.—LEPORIDÆ.

The Hares are at once distinguished from the other families of the rodent type, by the circumstance of their possessing four incisor teeth in the upper jaws. Two of these are very small, and are placed immediately behind the anterior pair, so as to present the appearance of double teeth, hence the Hares are sometimes called the *Duplicidentates*. The molars are generally twenty-two in number, six on either side above, and five correspondingly opposed below. They are destitute of roots, and are made up of two distinct laminæ. When the mouth is closed the lower series project inwards beyond the margin of the upper ones. This arrangement being associated with a certain facility of movement of the condyle of the lower jaw at its articulation, not found in other Rodents, it must be evident that the Hares employ a chewing action somewhat similar to that found in the ruminating mammals. The last molar tooth of the superior series is very small. The orbital fossæ are perforated by a common *foramen opticum*. The bony palate is incomplete; whilst, in the typical forms, the clavicles are also imperfectly developed. The soles of the feet are clothed with hair, there being five digits in front, and four posteriorly. The claws are long and narrow. The tail is either short or entirely absent. The Hares have a very wide geographical distribution in the hemispheres, being more particularly abundant in North America.

THE COMMON HARE (*Lepus timidus*)—Plate 16, fig. 53—is familiar to every one in these islands and is to be met with throughout Europe, except in Norway and Sweden. The general colour of the fur is tawny-grey, inclining to brown on the back, and to a rusty tint lower down; underneath the belly and throat it is white, as well as on the inferior surface of the tail, which, however, is usually directed uppermost. The ears are longer than the head, and more or less tipped with black in different individuals. Respecting its habits, they are almost too well known to need any lengthened record. To the sportsman, hares afford the excitement of the hunt, the amusement of the course, and the pastime of the gun. Of all the various methods employed in destroying these comparatively defenceless animals, perhaps that of shooting them is the least cruel, and therefore the most perfectly legitimate. The barbarities of the slaughter-house, where cattle are daily sacrificed for civilized man's consumption, are not one whit less cruel than the ordinary method employed for destroying game by shooting; and these animals, are "nothing to be refused," if received with thankfulness. While deprecating most sincerely any wanton cruelty in the use of these gifts, we hold the ordinary methods of destroying game to be quite consistent with mercy and humanity; and of one thing we are tolerably certain, that if *man* did not undertake to destroy these defenceless creatures in the usually summary manner that he does, their natural enemies would effect the same result, in ways far less considerate. For example, witness the case of the agonies of the poor hare (seen by the Rev. F. W. Hope, and recorded at page 91) with a weasel sticking to its throat! Witness again the instances where they fall into the merciless clutches of the fox, or even into the penetrating talons of the hawk tribe! Surely a charge of shot, or the sudden gripe of a greyhound, renders the agonies of death less prolonged and less painful than do the natural modes of death above cited. And, if so, why display a false and useless sentimentality in denouncing the conduct of those who, with the gun, cut short the existence of these creatures which are designed to form part of his means of subsistence? Whilst writing these very words, an important batch of game, including "puss," arrives from a friend in the country; and we respectfully beg to inform our readers that we shall allow no qualms of conscience, on the score that these creatures have fallen under the torture of powder and shot, to destroy the satisfaction we hope to derive from their consumption. This, at all events, is a practical view of the question. The hare feeds exclusively on vegetable substances, and causes terrible injury to young plantations, fields of early wheat, and other cereal crops. The habits of the hare are for the most part nocturnal. During the day they rest in open fields and stubbles, and especially in grassy situations. For partial concealment and comfort, they construct superficial hollows in the soil. These excavations are technically termed "forms," and they are more or less perfect, according to the character of the situation chosen. Here they rest in a cat-like crouching manner, with the chin and throat resting on the front paws. Hares are good swimmers, when occasion requires. Thus, in the fifth volume of *Loudon's Magazine*, Mr. Yarrell has recorded the following interesting circumstance:—"A harbour of great extent on our southern coast has an island near the middle of considerable size, the nearest point of which is a mile distant from the mainland at high water, and with which point there is frequent communication by a ferry. Early one morning in spring, two hares were observed to come down from the hills of the mainland towards the sea-side, one of which from time to time left its companion, and proceeding to the very edge of the water, stopped there a minute or two and then returned to its mate. The tide was rising, and, after waiting some time, one of them, exactly at high water, took to the sea, and swam rapidly over in a straight line to the opposite projecting point of land. The observer, on this occasion, who was near the spot, but remained unperceived by the hares, had no doubt they were of different sexes, and that it was the male that swam across the water, as he had probably done many times before. It was remarkable that the hares remained on the shore near half an hour, one of them occasionally examining, as it would seem, the state of the current, and ultimately taking to the sea at that precise period of the tide called slack-water, when the passage across could be effected without being carried by the force of the stream either above or below the desired point of landing. The other hare then cantered back to the hills." The female generally produces two young at a litter, but frequently as many as three, four, and even five; the leverets having their sight at the time of birth, and being able to shift for themselves at the expiration of about a month. A full-grown hare weighs eight or nine pounds, but an instance has been given of one which weighed upwards of thirteen pounds. The flesh is usually considered good eating, but in some specimens we have found it decidedly coarse. In cold climates the fur becomes lighter during the winter months. Black varieties also occur in this country; a fine specimen of this kind was shot a few years since on the grounds of Sir Edward Kerrison, of Broom Hall, in the county of Suffolk.

THE ALPINE HARE (*Lepus variabilis*) is a native of the mountainous districts of Northern and Southern Europe. The Alpine hare is rather smaller than the common form, and has a light, fulvous-brown fur, which becomes white on the approach of winter. The ears, however, which are shorter than the head, remain black-coloured at the tips throughout the cold season. The head itself is small, as is also the tail, when compared with that of *Lepus timidus*; the posterior pair of limbs being also shorter.

THE IRISH HARE (*Lepus Hibernicus*).—From a careful examination of several specimens, Mr. Bell considers this hare as specifically distinct from the above. It differs from the common hare in the relative proportion of the ears and head, which are much smaller; whilst it is distinguished from the Alpine species by the size and "form of the body, the tail, and the texture and colour of the fur," the latter exhibiting a uniform rufous-brown tint.

THE AMERICAN HARE (*Lepus Americanus*) is tolerably abundant throughout the more wooded parts of the entire northern continent from which it derives its specific title. In form, size, and general appearance it very closely resembles our English rabbit; feeding on grass and various vegetable matters, and being particularly fond of willow bark. During the winter, great numbers are destroyed on the banks of Mackenzie river by the Hare Indians, who capture them with snares. According to Sir John Richardson, this species has numerous other destructive enemies, "such as wolves, foxes, wolverines, martens, ermines, snowy owls, and various hawks; but the Canada lynx is the animal which perhaps most exclusively feeds upon it. It has been remarked that lynxes are numerous only when there are plenty of hares in the neighbourhood. At some periods a sort of epidemic has destroyed vast numbers of hares in particular districts, and they have not recruited again until the lapse of several years, during which the lynxes were likewise scarce. In the spring and summer the hares are much infested by a species of *cimex*. In the fur countries this hare becomes white in the winter." In the milder districts the ordinary greyish-brown colour is retained throughout the cold season—a phenomenon which also occurs in the Alpine species. Several thousand furs are annually imported to this country, under the title of rabbit skins, but their value is scarcely sufficient to reward the trouble of exportation.

THE PRAIRIE HARE (*Lepus Virginianus*) very closely resembles our common English species, not only in form and general appearance, but also in its habits and swiftness of foot. It is tolerably plentiful on the plains bordering on the Saskatchewan, and on those of Columbia. In winter the fur becomes pure white.

THE POLAR HARE (*Lepus glacialis*) is a large species, and now very generally considered to be distinct from the Alpine, or varying hare. The fur is quite white, except at the free ends of the ears, which are tipped with brownish-black. Its weight is said to extend to as much as fourteen pounds. The authority above mentioned states, that "although it does not frequent thick woods, it is often seen near the small and thin clumps of spruce fir which are scattered on the confines of the barren grounds. It seeks the sides of hills, where the wind prevents the snow from lodging deeply, and where, even in the winter, it can procure the berries of the Alpine arbutus, the bark of some dwarf willows, or the evergreen leaves of the Labrador tea plant. It does not dig burrows, but shelters itself amongst large stones, or in the crevices of rocks, and in the winter-time its form is generally found in a wreath of snow at the base of a cliff." It does not appear to be at all a shy animal, for Captain Lyon remarks that, while on the coast of Winter Island, the hares went out on the ice to the ships, to feed on the tea-leaves thrown overboard by the sailors. It may generally be approached within shooting distance without much difficulty. During the Arctic explorations of Dr. Kane and other bold adventurers, this little animal formed a frequent addition to their scantily provided feasts.

THE RABBIT (*Lepus cuniculus*) is familiar to every resident in the country throughout Europe. The brownish grey colour of the fur, becoming quite white underneath the tail and belly, associated with a ruddy tinge about the neck, are characters familiar to all. The ears are nearly as long as the head, but do not present the black markings at their ends, such as we find in the hares. The habits of the rabbit are too well known to require minute detail. Their destructive propensities are so great, that the generality of farmers extirpate them by every means at their disposal. Not only, however, do these little animals afford a considerable source of food to our population, but their skins are so highly valued for manufacturing purposes, that in addition to those procured at home, we have several hundred thousand skins annually imported into this country from Germany. Fortunately the rabbit is extremely prolific; and as it begins to breed at the age of six months, and is capable of producing litters of seven or eight young, six or seven times in the year, Pennant has calculated that in the course of four years, other conditions being favourable, the progeny of a single pair and their offspring, would amount to upwards of a million individuals!

THE LITTLE-CHIEF HARE (*Lagomys princeps*) is the name applied by Sir John Richardson to a small rodent, less than seven inches in length, and which inhabits the Rocky Mountains of North America. The fur is blackish-brown above and greyish beneath; the head being short and thick, and the ears somewhat rounded. It has no tail. "It is often seen at sunset, mounted on a stone, and calling to its mates by a peculiar shrill whistle. On the approach of man it utters a feeble cry, like the squeak of a rabbit when hurt, and instantly disappears, to reappear in a minute or two at the distance of twenty or thirty yards, if the object of its apprehension remains stationary." They do not appear to construct any kind of burrow, but make their habitations among crevices in the limestone rocks. The Little-Chief Hare is distinguished from its congeners in presenting small digital pads at the base and end of its toes; these have a black tint. The claws are also dark-coloured, short, compressed, and concealed by the fur.

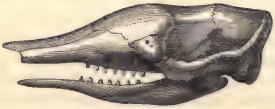
THE CALLING HARE (*Lagomys pusillus*)—Plate 16, fig. 54—is a native of the south-eastern parts of Russia and the slopes of the Ural Mountains, as well as of the western side of the Altai chain. The head is long, the ears large, short, and rounded, and the tail absent. The molar teeth are twenty in number; that is, five on either side of each jaw. The body is about six inches only in length. The fur has a greenish-brown colour, being hoary underneath. The Calling Hares frequent sunny banks in the neighbourhood of woods. They form burrows amongst the shrubs and herbage; their openings being difficult to detect, but for the peculiar cry which the occupants make. This noise, which can be heard at a considerable distance, is uttered at regular intervals every morning and evening, and sometimes during the day if the weather be cloudy. The Tartars apply to it the name of barking mouse, while the Cossacks of the Wolga call it *Semlanoi sactshik*, or ground-hare. The young at the time of birth are blind and destitute of fur.

Closely allied to this species is the Ogotona of the Monguls (*Lagomys Ogotona*), which is found to the south of Lake Baikal.

ORDER VIII.—EDENTATA.

THE group of mammalian individuals to which the above title is applied, vary considerably in their skeletal characters, while the ordinal sign by which they are indicated is altogether a misnomer. It is doubtless unnecessary to inform our readers that the term EDENTATA implies that the animals thus called are toothless; nevertheless, in a work like the present, it is not only correct that as few words as possible should remain unexplained, but that when an ambiguous phraseology is, through general acquiescence, adopted, an explanation of its meaning and the cause of its retention should both be satisfactorily explained. We have to remark, therefore, that the Edentata are so called merely from the circumstance that the several species of the order possess neither incisors nor canine teeth; though, indeed, an exception to this rule occurs in the case of two kinds of armadillo, the jaws of which display two incisors above, *i.e.*, one on either side at the posterior part of the intermaxillary bone, and two correspondingly opposed on each side towards the anterior part of the lower jaw; these latter apparently being entitled to come under the same serial category. Be that as it may, if any one doubts this statement let him procure and examine the skull of the six-banded armadillo, or in the event of not being able to procure the cranium, let him turn to the exceedingly accurate figure given in the 212th Plate of Cuvier's "Ossemen Fossiles;" and he will, we are assured, be convinced as to the incisive character of the superior pair just mentioned, from a consideration of the position which they occupy. He will at the same time be satisfied as to the very slender grounds on which the members of the present family are called Edentates. In all of them, we admit, there is a more or less conspicuous deficiency of dental organs at the fore part of the mouth (fig. 49); but, as if further to demonstrate the absurdity of the common title, the molars are in some species remarkably numerous, no less than one hundred small grinders being observed by Frederick Cuvier in the jaws of the great armadillo of Surinam! But without dwelling further on this point, we pass on to notice that the teeth, if considered by themselves, are extremely simple both in their structure and external configuration, presenting no roots at their basal surfaces; this part of their conformation being hollowed out so as to favour a continuous and progressive growth from below upwards. Histologically speaking, they are made up of dentine and cement, and have no enamelled cappings or ridges on their crowns. In regard to the skeleton, striking differences occur in the various genera, according as to whether they pursue arboreal habits, feeding on vegetable matters, as in the sloths—Plate 34, fig. 112—or, on the other hand, exhibit insectivorous propensities, and do not possess the power of climbing, as in the ant-eaters—Plate 33., fig. 107. Among the most striking of these differences are those which refer to the structure and configuration of the osseous element entering into the constitution of the head, tail, and extremities. Can anything be more significant than the attenuated, narrow, and long cranium of Myrmecophaga, and the abrupt, short, and broad skull of Bradypus? Observe how conversely the comparison holds good in respect of the limbs—drawn out and armed with long claws in the sloth; shortened and furnished with trowel-like nails in the ant-eater! And, lastly, remark the powerful tail in the last-named animal, while the caudal development of the former is reduced to a mere useless appendage. It is needless to enlarge further on these distinctions, yet we cannot quit this introductory part of our subject without calling attention to the gigantic sloths of a former epoch. The skeletal elements of the Mylodon and Megatherium exhibit a relative massiveness which utterly throws into the shade any features of a similar kind seen in the stoutest living Edentates, while pachyderm skeletons look slender and feeble in comparison with their monstrous bones! The dwarfish living representatives of that giant race still occupy the swamps and woods of South America; and, whilst not a few of the scaly tribe also occur in the tropical regions of the eastern hemisphere, none of any sort are known to inhabit the continent of Europe.

Fig. 49.



Skull of the Armadillo.

FAMILY I.—MANIDÆ.

The Scaly Ant-eaters or Pangolins are, in every sense of the term, true Edentates, being altogether destitute of teeth. They have a long, round, extensible tongue, and very small ears, which in some instances are scarcely visible. Speaking generally, their most characteristic feature consists in the possession of an integumentary armature of trenchant, horny, imbricated scales. These are disposed in rows somewhat like tiles on the roof of a house, and when the animals roll themselves up, after the manner of hedgehogs, into the form of a ball, the sharp posterior edges of the scales project like so many points of a cupping lancet, and together constitute a powerful means of defence. Numerous light-coloured hairs project from between the scales. The head is elongated and narrowed in front. The limbs and feet are short, pentadactylous, or tetradactylous, and furnished with curved fossorial claws. The tail is largely developed and of very remarkable strength. The skeleton displays no clavicles, and there is no cœcum in connection with the intestinal canal. The Pangolins are natives of the warmer regions of Asia and Africa. Their movements are comparatively slow; they feed upon various kinds of insects, and more especially upon ants and termites.

THE SHORT-TAILED PANGOLIN (*Manis pentadactyla*), or BADGAREIT, is also known as the Broad-tailed Manis, and is supposed to be the Phattagen described by Ælian. It is an inhabitant of the continent of India and Ceylon, and is the largest species at present living. In the interior of Hindostan the natives apply to it a number of curious names: thus, in the Deccan, it is termed the "tiled-cat;" elsewhere it is called the "land-carp;" and in Ceylon the "negumbo devil." The body approaches four feet in length, including the tail, which is not quite so long as the body and head together. Although this animal is very valuable as a destroyer of white ants and their huge nests, it would appear from the observations of travellers that the Badgareits are frequently subjected to mere wanton cruelty on the part of the Asiatic natives.

THE LONG-TAILED PANGOLIN (*Manis tetradactyla*) —Plate 17, fig. 58—is so named on account of the extraordinary development of the caudal extremity. It is a small animal, about three feet in length at the most; but the tail is twice as long as the body, and contains no less than forty-seven vertebral segments, while in the animal above described there are only twenty-six of these bones. This species, the scales of which are black, and yellow at the margins, is a native of the coast of Guinea.

THE MANY SHIELDED PANGOLIN (*Manis multiscutata*), or PHATAGIN, has been thus named by Dr. J. E. Gray, from the circumstance that the horny scales forming its dermal armature are disposed in rows varying from nineteen to twenty-one in number; whereas in the two species above noticed, there are only eleven rows. This species, the scales of which are small, of a yellowish-grey colour, and three-pointed posteriorly, is also a native of the coast of Guinea.

TEMMINCK'S PANGOLIN (*Manis Temmincki*) is a native of Southern Africa, being found to the north of Cape Colony, in the neighbourhood of Mozambique, and also in Sennaar. The body is rather more than two feet in length, including the tail, which measures about a foot. The scales are disposed in eleven rows, the last four rows having only four scutes in each, while those of the anterior series have five. It is a scarce animal, its almost total extinction having been brought about by a prevailing superstition among the natives that it has some evil effect upon cattle. Accordingly, when they catch any unfortunate Pangolin, they burn it alive as an offering to the deity, in the hope that some advantage may accrue to their flocks! It is, however, a poor harmless little beast, feeding, like its congeners, principally upon ants.

FAMILY II.—MYRMECOPHAGIDÆ.

Under this head are brought together the Ant-eaters properly so called. They are distinguished from the pangolins by the substitution of an abundant hairy fur in place of the scaly covering above described. None of the typical Ant-eaters display any organs of dentition; but in the aberrant genus *Orycteropus*, we find in young individuals upwards of twenty molars. Usually also the ears are short, rounded, and feebly developed; but in the particular genus referred to they are long and sharply pointed. The tail is of considerable length in all the species. Another peculiarity of great interest has reference to the feet; for here we notice in the fore-limbs that the ultimate phalanges of the toes, which support the claws, are so constructed as to allow the movements of the latter being restricted to flexion inwards; and in order to maintain this position, there are powerful ligaments which keep the phalanges directed towards the palm, and never allow the digits to be stretched out in the manner of the plantigrade carnivora. The relative size and strength of the toes is also very significant, both in this family and in the preceding; in those which have five toes the central digit attains an enormous bulk, while the outer pair are comparatively small. In order, moreover, to afford adequate power for the digging and burrowing propensities of these animals, the phalanges are all closely connected together up to the base of the ultimate phalanx, converting the hand into a sort of trowel similar to that found in moles. From what has been advanced, therefore, it will readily be remarked, that the Ant-eaters do not walk on the soles of their feet; neither do they tread on their strongly-curved toes, which would damage the claws, but, in the fore-feet at least—as may be seen by referring to the drawing of the Great Ant-eater given in Plate 17, fig. 57—the anterior part of the body is seen to rest entirely upon their outer edge; and that part of the hands thus subjected, as it were, to an unusual pressure, is in these creatures supplied with an efficient callous pad to protect the outer phalanges from injury. Another circumstance in the organization of these creatures which has especial claim upon our attention, is the remarkable development of the anterior part of the head, and the more than coextensive elongation of the tongue. In the typical species this organ is rounded, and marked by annulations which indicate the several muscular rings entering into its composition; but in the aberrant genus previously alluded to, the lingual organ assumes a flattened form: in the typical species it can be extended to nearly twice the length of the head. Such, in brief, are the leading characteristics of this singular family; all of them pointing to their insectivorous habits, and demonstrating a special design in their construction and adaptability to the mode of life they lead. Having torn open the habitations of ants and other nest-building insects, the swarming myriads issue forth to give battle to the unceremonious intruder; the slimy and extensile organ is immediately presented to the astonished crowd, who, collecting on the glutinous appendage, are, within less than a second of time, drawn within the capacious maw of the keen and small-eyed myrmecophaga! The typical species seem, in South America—where they alone occur—to represent the scaly pangolins of Asia and Africa; but the single aberrant genus *Orycteropus* is a native of the last-named continent.

THE GREAT ANT-EATER (*Myrmecophaga jubata*)—Plate 17, fig. 57—is a native of Brazil, Surinam, Columbia, Paraguay, and, in short, of all the tropical districts of South America. By the English and Spanish colonists it is known as the Ant-bear; but one would have supposed that its attenuated head and toothless jaws would have been sufficient to have preserved it from such a misplaced designation. And this leads us to diverge a little from the immediate subject of our description, and to remark how singularly perverse are colonists in all quarters of the globe on the subject of animals. It is in vain that you shall protest that the Great Ant-eater is not a "bear." It is in vain that you shall explain the non-existence of sea-serpents, or prove to demonstration that tigers, properly so called, do not live in Africa! Your Dutch settler, and your English explorer, having met with a "spotted hyæna," or with a "serval," forthwith put it down for a fact that tigers—yes, real tigers!—occur in Africa. Even this very day, while we are writing—24th September—a member of the Livingston expedition records in the *Times* an encounter with a tiger; and thus, with the apparent sanction of those who, we are assured, know better, these false notions are propagated from age to age. But we must return to our edentulous ant-eater. This great species measures about four feet from the tip of the snout to the root of the tail, which, if included, would give us another thirty inches, or upwards of three feet if the long hair at the extremity be taken into consideration. The head alone is about fourteen inches long, being extremely narrowed towards the snout. The eyes are particularly small, and protected by naked lids. The fur is long, and more especially at the anterior part of the back, over the region of the shoulders. The tail is very bushy, the long harsh hairs assuming a bristly character. The general colour of the fur is greyish-brown; but the under part of the chest and throat is black, and from this part there proceeds obliquely upwards on either side a dark band, which, as it passes over the shoulder, gradually diminishes and becomes narrowed to a point over the region of the loins. This black line is also rendered more conspicuous by parallel bars of a whitish tint which embrace it, so to speak, throughout its entire length. According to D'Azara the Great Ant-eater generally invades low swampy grounds, and the banks ot rivers and stagnant pools; and although not able to climb, it is frequently found in dense thickets. Its movements are slow, and even when pursued it is easily overtaken by any person on foot. Being very stupid it offers but a feeble resistance, and consequently is easily taken or destroyed. It passes the greater part of its existence in a state of repose, sleeping with the head doubled up underneath the hairy chest, whilst the thick tail is curved over the body to protect it from the powerful rays of the sun. These animals are nowhere very numerous, and consequently have no difficulty in procuring sustenance from the multitudes of ants' nests which abound in the warm parts of South America. The female produces a solitary cub, which she carries about on her back, even after it has attained sufficient growth to shift for itself.

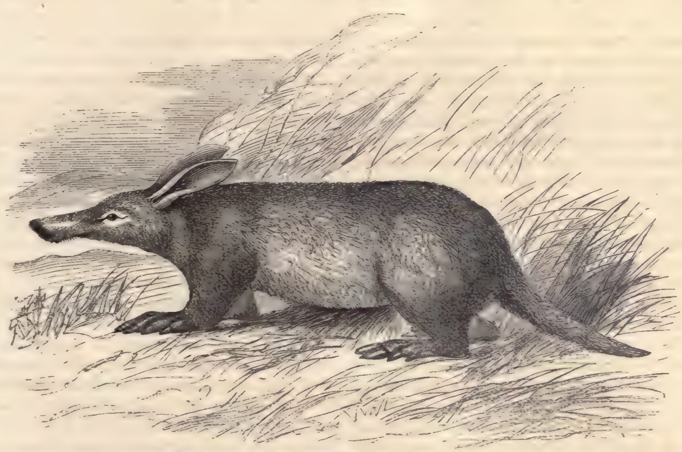
THE LITTLE ANT-EATER (*Myrmecophaga didactyla*) is also known by the name of the two-toed ant-eater, from the circumstance of the fore-feet being didactylous. The hinder extremities are tetradactylous. This species is of very diminutive proportions; the entire body being less than fourteen inches in length, and the tail appropriating more than half of this measurement. The fur has a pale fulvous colour generally; but it is brownish on the back. The head is much shorter than in the great ant-eater, the snout terminating more abruptly. The skeleton exhibits several peculiarities, but we have only space to mention the remarkable breadth of the ribs. The Little Ant-eater is a native of Brazil and the northern parts of South America. Its habits are similar to those of its more powerful congeners. Von Sack, in his "Voyage to Surinam," gives an interesting account of the tame ones in his possession; and after describing their characters, he tells us that the inhabitants of that country aver, that when captured these animals will not be induced to eat, and only lick their paws after the fashion of a bear. "When I obtained the first," says Von Sack, as quoted by Mr. Ogilby, "I sent to the forest for a nest of ants, and during the interim I put into its cage some eggs, honey, milk, and meat; but it refused to touch any of them. At length the ants' nest arrived; but the animal did not pay the slightest attention to it either. By the shape of its fore-paws, which resemble nippers, and differ very much from those of all the other species of ant-eaters, I thought that this little creature might perhaps live on the nymphæ of wasps, &c. I therefore brought it a wasps' nest, and then it pulled out with its nippers the nymphæ from the nest, and began to eat them with great eagerness, sitting in the posture of a squirrel. I showed this phenomenon to many of the inhabitants, who all assured me that it was the first time they had ever known that species of animal to take any nourishment. The ants with which I tried it were the large termites upon which fowls are fed here." According to Von Sack and most observers, the tail is employed as a prehensile organ. It is, as we have seen, larger than the body, very stout and broad at its origin, thickly clothed with short hairs, and much attenuated towards the extremity. Generally speaking, the fur displays a thick, soft, shining, woolly texture. The female, it is said, produces a single young one at a birth, although it is furnished with four mammæ.

THE TAMANDUA (*Myrmecophaga Tamandua*) is, in respect of size, intermediate between the two above-described species; the body measuring upwards of two feet in length from the extremity of the snout to the root of the tail, while the latter organ would give us nearly eighteen inches more. The colour of the fur is subject to considerable variation; and to so great an extent is this the case, that a number of well-marked forms have been recognized, and by some the more noticeable of them have been regarded as so many distinct species. Most, if not all, display a dark band on the fur, running diagonally over the shoulders from below upwards. The woolly hairs are comparatively short, and the tail instead of being bushy at the tip, as in the great ant-eater, terminates in a narrow, scaly, prehensile point. The feeding habits of the Tamandua very closely resemble those of the last-named animal; but it infests the thickest forests of Brazil and the neighbouring districts, living almost exclusively on the trees. It is particularly partial to honey, and proves terribly destructive to the wild and stingless bees which form their nests among the highest branches.

The female brings forth a single cub at a birth. For some months the young preserves a pale-yellow colour, and is carried about on the back of its parent until it is able to shift for itself.

THE AARD-VARK (*Orycteropus Capensis*) or GROUND-HOG, differs from the foregoing in several important particulars. Some of these we have already described in our introductory observations; but we have further to observe regarding the feet, that they are comparatively shorter and stouter than obtains in the true ant-eaters, the anterior pair being tetradactylous, and the posterior pentadactylous. A very distinctive character is seen in the head, which is furnished with large pointed ears; while the tail, being of moderate length, not so long as the body, is very thick, rounded at the root, and densely clothed with hair (fig. 50). Altogether it is a stout, heavy animal, the large bones of the neck in particular demonstrating its strength in the cervical region. The fur, which is very scanty, exhibits a greyish-brown colour generally. The permanent teeth of the adult, twenty in number, have a simple form and structure, being made up of rootless cylinders, those in front displaying a slightly flattened aspect at the sides. The Aard-vark is a very common animal throughout the southernmost parts of Africa. It is rather larger than the common badger, attaining a length of upwards of four feet. Its habits are nocturnal, and it constructs large subterraneous burrows with extrordinary rapidity. It appears to live entirely upon ants, and for this purpose the tongue is largely developed, and armed with a glutinous secretion. This organ, however is not so long as in the true ant-eaters, while it is at the same time more flattened and attenuated. The Aard-vark invariably fixes his retreat near to some large ants' nests, which he ventures only to attack after dark. He is a timid creature, and does not move far from his burrow; and when attacked, should he succeed in gaining access to his abode, it is next to impossible to get him out; for it is said he can burrow faster than his enemies can dig. According to those who have witnessed its method of procuring food, the Aard-vark, having approached an ant-hill, forthwith proceeds to scratch a small part of it, just sufficient to allow of the introduction of its long, narrow snout. These ant-hills, it must be remembered, are sometimes three or four feet in height, and contain myriads of insect inhabitants — strongly ensconced in fancied security complete! "Here," observes Mr. Ogilby, "after having previously ascertained that there is no danger of interruption, he lies down, and inserting his long slender tongue into the breach, entraps the ants, which fly to defend their dwellings upon the first alarm, and, mounting upon the tongue of the Aard-vark, get entangled in the glutinous saliva, and are swallowed by whole scores at a time. If uninterrupted he continues this process till he has satisfied his appetite; but on the slightest alarm he makes a precipitate retreat, and seeks security at the bottom of his subterranean dwelling. Hence it is that these animals are seldom seen, even in those parts of the country in which they are most numerous. Like other nocturnal animals, passing the greater part of their lives in sleeping and eating, they become exceedingly fat, and their flesh is considered to be wholesome and palatable food. The hind quarters particularly, when cut into hams and dried, are held in great esteem."

Fig. 50.



The Aard-vark or Ground-hog (Orycteropus Capensis).

FAMILY III.—DASYPIDÆ.

Under this title are brought together an interesting little group of animals familiarly known as the Armadillos. We treat of them in this place because they represent a type of structure intermediate between the ant-eaters and the family we have next to consider—

namely, the sloths. The armadillos are readily recognized by their hard coat of mail, consisting of numerous many-sided plates closely soldered together. The individual scales have most commonly a hexagonal form, are osseous in structure, and so combined as to form a series of bucklers completely investing the superior and lateral parts of the body. In order, however, to allow a certain degree of movement, a series of slightly elastic bands, varying in number, are found intersecting the dermal shield at the centre of the back. These zones are partly bony and partly integumentary, the latter structure having a dense pliable, and leathery consistence. The front and upper parts of the head are also furnished with a small shield, the scutes resembling tesselated pavement. The internal skeleton likewise displays several points of interest. The clavicles are well developed, the first rib on either side being remarkably broad. Another peculiarity is seen in the presence of a second spinous-like ridge, projecting from the posterior and outer surfaces of the scapula. This is also seen in the true ant-eaters, but not in the aard-vark. The acromion process of the shoulder-blade is likewise unusually prominent. The teeth have a cylindrical form, and vary considerably in different species. The feet are in some cases all furnished with five toes; but in others the anterior pair are tetradactylous. The under parts of the belly are loosely clothed with a thin fur, whilst a few thin wiry hairs also project from between the scutes of the dermo-skeletal bucklers, and from the soft parts of the semi-elastic zones. The tail is long in a few species, but in others very short. It is usually protected by rings of small scutes, which in certain forms degenerate, so to speak, into mere tubercles, whilst in others this organ is altogether naked. The armadillos are natives of South America; and in that country we find the fossil remains of an allied genus called the Glyptodon, which was a large animal, possessed of immense strength and a proportionately thick and complicated dermal armour. The armadillos feed on vegetable matters, and construct burrows into which they retreat when pursued.

THE PEBA (*Dasypus peba*)—Plate 17, fig. 56—or BLACK ARMADILLO, is very abundant in the district of Paraguay; being also found in Guiana and Brazil, but not to the south of the Rio de la Plata. This species has likewise been designated the Long-tailed Armadillo, the Black Tatou, the Tatouhou, and the nine, eight, or seven banded armadillo, according to circumstances; these bands having been regarded as criteria of specific distinctness, and the same animal described as so many separate species. The Peba is not quite a foot and a half in length, exclusive of the tail, which measures other fourteen inches. The head is elongated, and much narrowed towards the snout. The ears are conspicuous, long, sharply pointed, and closely approximated. The limbs are short, and the feet comparatively small. The dermal armature may be divided into three portions, namely, the cephalic, humeral, and iliac bucklers, according to the regions they invest. The two latter are made up of semicircular parallel rings, whose concavity is directed forwards towards the head, and between them are the bands which occasionally overlap each other during the turning movements of the body. The molar teeth are thirty-two in number; that is, eight on each side of either jaw. The Peba is an expert burrower, and when pursued its only chance of escape depends upon its gaining access to its dwelling. It is generally found in the more open grounds and cultivated districts. The olfactory powers of this little animal are extremely acute; and as affording an example of this faculty, D'Azara relates the following incident—"My friend Noseda," he says, "having arranged a trap for the purpose of taking chibigazous, and having placed in it, by way of bait, a cock with a small quantity of maize to support him, it so happened that a few grains of the maize fell through between the boards which formed the bottom of the trap. An armadillo arrived during the night, and wishing to get at the maize thus accidentally spilt, opened a trench or burrow at some distance from the trap, and without deviating a hair's breadth from the straight line of his direction, pushed it on to the very spot where the grain had fallen, and possessed himself of the booty." The food of the Peba and its allies consists principally of vegetable matters, such as maize, potatoes, roots of the mandioc, fallen fruits, &c.; but it also at times partakes freely of animal food in the shape of ants, worms, frogs, lizards, vipers, eggs of birds, dead and half-decomposed carrion of wild cattle—in short, almost anything, including even the contents of human graves when access can be gained to them. Notwithstanding all this, the South American natives and colonists generally, pronounce its flesh to be a real delicacy, especially when roasted in the shell.

THE PICHEY (*Dasypus minutus*) is a very diminutive species of armadillo, measuring only ten inches from the tip of the muzzle to the root of the tail, which latter organ is about half the length of the body. It is an inhabitant of the Pampas lying to the south of Buenos Ayres, extending nearly to the borders of Patagonia. The bands between the humeral and iliac bucklers vary in number according to the age of the animal. Generally speaking, these are either six or seven, each ring consisting of a number of lineally arranged quadrangular plates. The tail is scaly, and tolerably well furnished with hairs. The limbs and claws are of moderate size. The Pichey constructs burrows, but is often seen abroad even during the day, and only occasionally retires into its habitations. In other respects its habits are believed to resemble those of its congeners generally; and in common with the majority of them its flesh is highly esteemed, being exceedingly delicate and well-flavoured.

THE TATOUAY (*Dasypus Tatouay*) is a comparatively rare species found in Brazil and Guiana. It is called the Wounded Armadillo, from a notion entertained by the natives that its tail has been deprived of the osseous covering seen in other species. This organ is about eight inches in length, and is almost entirely destitute of any protecting crust, the naked skin being thinly clad with short brown hairs above, and a few scales on the lower surface. The body is about a foot and a half long, the head being less narrowed anteriorly than in the preceding species. The molars are thirty in number—fourteen below and sixteen in the upper series. The ears are largely developed, and about two inches from root to tip. One of the most distinguishing characteristics is seen in the enormous enlargement of the digits of the anterior feet. These clearly demonstrate the exalted nature of its burrowing powers; but beyond this little is known of its habits. In the catalogue of Edentata preserved in the British Museum, this species is denominated *Xenurus unicinctus*.

THE POYOU (*Dasypus sexcinctus*) is one of the commonest forms of armadillo, and is especially abundant in the province of Paraguay. It is at once recognized by its remarkable breadth as compared with its height. The body measures sixteen inches from the tip of the muzzle to the root of the tail; this organ being about eight inches long, and protected at the base by three or four osseous plates in the form of rings, while throughout the remainder of its extent it is covered with small scaly tubercles. The limbs, as we have hinted, are very short; nevertheless the animal is very swift of foot. The head is broad, flat, triangular, and truncated at the muzzle; the ears being of moderate size, and widely separated from each other. Its habits are similar to those of its congeners; but as it is particularly fond of carrion, its flesh is not considered by the Spanish and other European colonists of South America to be so good eating, as those species whose diet is exclusively vegetable.

THE HAIRY ARMADILLO (*Dasypus villosus*) is rather smaller than the above, and is a native of Buenos Ayres and the districts south of the Rio de la Plata. So abundant is it in the plains of these regions, that D'Azara writes as follows:—"In an expedition which I made into the interior, between the parallels of 35° and 36° south latitude, I met with vast multitudes of this species of armadillo; so that there was scarcely an individual of the party who did not each day capture one or two at least; for, unlike the Poyou, which moves abroad only during the night, this animal is to be found at all times, and upon being alarmed promptly conceals itself, if not intercepted. In March and April, when I saw them, they were so extremely fat that their flesh surfeited and palled the appetite; notwithstanding which, the pioneers and soldiers ate them roasted, and preferred them to beef and veal." The distinguished Spanish officer and naturalist further observes, that the Hairy Armadillo "scents the carcasses of dead horses from a great distance, and runs to devour them; but, as it is unable to penetrate the hide, it burrows under the body till it finds a place which the moisture of the soil has already begun to render putrid. Here it makes an entrance with its claws, and eats its way into the interior, where it continues feasting on the putrid flesh till nothing remains but the hide and bones; and so perfectly do these preserve their position, that it is impossible from a mere external view to anticipate the operations which the armadillos have been carrying on within." This species does not construct burrows for the purposes of habitation, and is always met with on dry open grounds. It is, as the name implies, better provided with hair than obtains in the case of its congeners. The bands vary numerically, there being usually six or seven. The teeth are thirty-two in number, equally divided above and below. The ears are conspicuously developed; but the most characteristic feature of this species arises from the sharp, projecting margin of the lateral bands and tesselated bucklers at the lower part of the body.

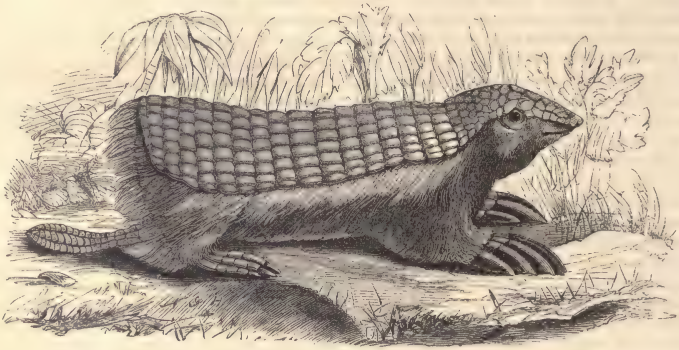
THE MATACO (*Dasypus tricinctus*) is another very interesting form of armadillo living in Brazil, Paraguay, and Buenos Ayres. It is also denominated the Bolita, on account of a propensity to roll itself up into a ball. It is nearly as large as the Poyou, excluding the tail, which in the Mataco is reduced to a mere appendage scarcely more than two inches in length. The limbs and feet are rather small and feeble. The head is short, pear-shaped, and armed with a cephalic mail; whilst the bucklers, which are made up of osseous polygonal plates somewhat irregularly disposed, are strongly developed and separated from each other by three broad, movable bands; this latter character rendering the Mataco distinct from all other species of armadillo. The ears are comparatively short and rounded. The Mataco is rather a scarce animal, probably from the facility with which it is captured; for, when pursued, having no burrows wherein to hide itself, and being a slow runner, its only mode of defence consists in rolling itself up into a helpless sphere.

THE GREAT ARMADILLO (*Dasypus gigas*) is not only distinguished by its great bulk, but also by the possession of a multitude of molar teeth, varying in number from eighteen to one hundred. Exclusive of the tail, the body measures about forty inches in length, while the caudal extension would give us some sixteen or eighteen inches more. The ears are small, but the head is more cylindrical than in the generality of species. The humeral and iliac bucklers are made up of numerous rows of square-shaped plates, and are separated from each other by twelve or more movable bands inclosing scutes of a similar character. The long tail is comparatively stout at the base, and is armed throughout with a close-set mail of osseous rings, presenting externally an appearance of spiral lines crossing each other obliquely. The native Botucodos employ this dermal armour of the tail to form speaking trumpets, which they use in the densely wood-bound forests of Brazil and Surinam. The digits of the fore-feet are enormously developed, as in the Tatouay, the middle and fourth toes being furnished with large trenchant claws. These digging weapons they employ with such skill and power, that in burying their dead the natives are obliged to place strong barriers of stakes, planks, and stones in order to have a resting-place for their departed companions, secure from the depredations of this gigantic carrion-loving armadillo.

THE PICHICIAGO (*Chlamydophorus truncatus*) forms the type of a remarkably aberrant genus, in many respects closely allied to the true armadillos. It is a native of Mendoza, on the eastern slopes of the Cordilleras, and of other parts of Chili. In point of size it comes very near to the common mole, the body measuring a trifle more than five inches from before backwards. Its anatomy has been very closely investigated by Dr.

Harlan of New York, Mr. Yarrell of London, and Dr. Hyrtle of Vienna; and each of these distinguished naturalists have published lengthened memoirs upon the subject. From their combined descriptions we gather the following particulars:—The molar teeth are thirty-two in number, have a simple structure, and are equally distributed above and below. The head presents the figure of a cone, sharply pointed at the muzzle, and widening out at the occiput; the bones of the skull do not display any trace of sutures in the adult cranium, and over the upper part of the frontal elements there arise two small globular osseous masses, the function of which will be immediately rendered apparent. Scarcely any trace of an ear can be detected on the outer surface, this organ being represented by a patulous opening, marked by a slightly elevated margin, and situated immediately behind the small, black, half-concealed eyes. The oral opening is not large; but the nose is furnished with an extended cartilaginous septum internally. One of the most striking peculiarities of the Pichiciago consists in the uniform hard dermal armature, protecting the entire length of the head, neck, and back (fig. 51). This coriaceous covering is made up of numerous square, rhomboidal, or cubical plates, closely connected together by a tough leathery development of the epidermis; these plates are disposed in rows, of which there are twenty-four. Throughout the greater part of its extent, this shield is only loosely attached to the body by soft connective tissue; but, along the central line of the back, it is more firmly adherent to the capitals of the vertebral spinous processes, whilst, at the free part of the head, it is very firmly fixed to the two frontal osseous prominences above described. Posteriorly the dorsal shield terminates abruptly, imparting to the hinder quarters an unusual appearance. This part of the body, however, is carefully protected by five semi-circular rings of plates, having a structure precisely similar to those on the back. At the lowermost part, the anal shield is notched for the growth and lodgment of the tail, into which crevice this organ is, as it were, lodged, and is, under ordinary circumstances, doubled up beneath the belly. It presents the character of a rigid cylinder, but at the tip it is flattened out in a spatulate manner, to form a kind of paddle. At the semi-circumferential margin of the anal shield, and along the side of the dorso-cephalic covering, there is developed an extensive fringe of silky hairs, the under parts generally being thickly clothed with fur. All the feet are pentadactylous, the claws of the anterior pair being remarkably long, slightly curved, and sharply pointed; the several digits are intimately bound together, and are so disposed that the claws when acting together form a kind of scoop. The hinder extremities are, comparatively speaking, small and feeble, the toes being also more widely separated from each other. Respecting the habits of the Pichiciago very little is known, but from the statements of Mr. Closeberry, the original discoverer of the species, there is every reason to believe that its mode of living very nearly resembles that of our common mole. It dwells almost entirely under ground, its limbs at once showing how unfitted it is for rapid progression on the surface. The female is said to carry her offspring beneath the margins of her dorsal shield; but this statement requires confirmation.

Fig. 51.

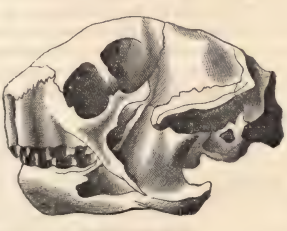


The Pichiciago (Chlamydophorus truncatus).

FAMILY IV.—BRADYPIDÆ.

Following Cuvier, some naturalists prefer to consider the Sloths under the family title of *Tardigrada*, as indicating one of the most remarkable characteristics of this tribe of animals. The tardigrades then, or, in simpler phrase, slow-moving Edentates, are at once distinguished by a peculiar conformation of the extremities, admirably fitting them for an arboreal mode of existence, but rendering their movements on the ground very awkward, for the obvious reason that they are unnatural. If we examine the skeleton of an ordinary Sloth—Plate 34, fig. 112—the first thing that strikes us is the unusual size and extension of the limbs, and especially of the anterior pair; the latter are very nearly twice as long as the hinder extremities, and in this feature we are inevitably reminded of a similar arrangement in the limbs of certain quadrumana whose habits are in some respects analogous to those of the family under consideration. On closer inspection of the hands, it will be noticed that the bones of the carpus and metacarpus are short and ankylosed together, whilst the terminal digits are long, and furnished with immense hooked claws. These prehensile talons are closely curved towards the palm while not in use, or in a state of rest; but when the animal requires to grasp a fresh branch, they are forcibly extended by muscular contraction, assuming a position like that given in the raised arm of the accompanying representation, above referred to. The hind feet are similarly constructed, and a glance at their position, with the soles directed obliquely inwards, is sufficient to show how unnatural it is to represent a Sloth walking all-fours on a plain level surface. In the older natural history collections of the United Kingdom, nothing is more common than to observe the errors into which taxidermists have fallen in mounting and displaying the stuffed skins of Sloths; and we could still point to fine collections where the tardigrade edentates may be seen sprawling on the floor in the most approved style, with their backs toward the sky! Having personally inspected, with care, the principal museums of natural history in London, Edinburgh, Glasgow, and Dublin, we have no hesitation in saying that, if any one wished to see the way in which Sloths ought to be stuffed, they would do well to take a glance at the specimens preserved in the museum of Trinity College, Dublin—and they are not the only evidences of taxidermal skill to be seen in the Irish capital. But, to return to our skeleton, and the figure reduced from that given in Cuvier's celebrated "Ossemens Fossiles"—let us next examine the head (fig. 52). Here we have a striking contrast when compared with the attenuated crania of the ant-eaters.

Fig. 52.



Skull of the Sloth.

The Sloth's head is short, rounded, flat, and truncated at the muzzle; the jaws are generally furnished with eighteen molar teeth—the anterior pair, above and below, having been regarded by Cuvier as incisors; the young individual carries twenty molars. In the construction of the bones of the trunk, and especially of the pelvis, we notice other interesting adaptations to the peculiar habits of these creatures; but among these we have only space to mention the remarkable elongation of the neck. This cervical extension was at one time supposed to be due to the presence of nine true neck-vertebræ; but some years since, Professor Bell satisfactorily demonstrated, from prepared skeletons in his own collection, that the so-called eighth and ninth cervical veretebræ were, in reality, true dorsal segments, seeing that he had discovered a pair of little rudimentary ribs attached to each of the osseous elements in question. "The object," says Mr. Bell, "of the increased number of vertebræ in the neck, is evidently to allow of a more extensive rotation of the head; for, as each of the bones turns to a small extent upon the succeeding one, it is clear that the degree of rotation of the extreme point will be in proportion to the number of movable pieces in the whole series. When the habits of this extraordinary animal are considered, hanging as it does from the surface of boughs with the back downwards, it is obvious that the only means by which it could look towards the ground must be by rotation of the neck; and as it was necessary, in order to effect this without diminishing the firmness of the cervical portion of the vertebral column, to add certain movable points to the number possessed by the rest of the class, the additional motion was acquired by modifying the two superior dorsal vertebræ, and giving them the office of cervical, rather than infringing on a rule which is thus preserved entire without a single known exception." As we shall immediately have occasion to return to the consideration of the habits of these animals, we have here only further to observe that the Sloths are all natives of the forests of South America, where they feed upon vegetable matters, chiefly leaves. The extinct genera, *Megatherium*, *Megalonyx*, *Scelidotherium*, *Erinathopsis*, and *Ereptodon*, are also referable to this family, forming the subdivision of *gravigrade* edentates.

THE AI (*Bradypus tridactylus*) or THREE-TOED SLOTH—Plate 17, fig. 55—is the best known of all the species. The specific term applied to it rests upon the arbitrarily assumed grounds that it is the only species which is furnished with the three toes; but there is every reason to believe that at least two other Sloths—the *B. gularis* of Rüppell, *B. torquatus* of Illiger, and *B. infuscatus* of Wagler being regarded as so many distinct species—have tridactylous feet. Be this as it may, the generality of naturalists appear content to retain the old Linnæan appellation, and we shall not deviate in the present instance from their combined authority. The Ai inhabits the most secret recesses of the South American forests. The body is enveloped by a coarse shaggy fur, and so disposed about the short round head, as to impart to the physiognomy a human look. The fur has a greyish colour generally, young individuals being frequently spotted with brown and white; the under parts have usually a light fulvous tint. When describing the skeleton, we took occasion to remark somewhat on the habits of this animal, and especially referred to its awkward behaviour when placed on a level surface. One of the most singular errors into which the great French anatomist fell, was that of ascribing to the Ais deficiencies and imperfections of organization, as if they were not well adapted to the mode of existence which the Creator had been pleased to assign to them. "These animals inhabit trees," says Cuvier, "and never remove from that on which they are located until they have stripped it of every leaf, *so painful to them is the requisite exertion to reach another!*" Our readers are well aware how frequently these errors have been exposed by Bell, Blyth, Buckland, Broderip, Owen, and a host of other distinguished English writers; nevertheless we have pleasure in quoting some apt remarks of the last-named authority, recently given in his manual of the "Skeleton and Teeth." Alluding to the Ai, Professor Owen observes that "it is less able to raise its trunk above its limbs than the seal, and can only progress by availing itself of some inequality of the soil offering a holdfast to its claws, and enabling it to drag itself along. But to judge of the creative dispensations towards such an animal by observation of it or report of its procedure under these unnatural circumstances, would be as reasonable as a speculation on the natural powers of a tailor suddenly transferred from his shopboard to the rigging of a ship under weigh, or of a thorough-bred seaman mounted for the first time on a full blood-horse at Ascot. Rouse the prostrate Sloth, and let it hook on to the lower bough of a tree, and the comparative agility with which it mounts to the topmost branches will surprise the spectator. In its native South American woods, its agility is still more remarkable, when the trees are agitated by a storm. At that time the instinct of the Sloth teaches it that the migration from tree to tree will be most facilitated. Swinging to and fro, back downwards, as is its habitual position, at the end of a branch just strong enough to support the animal, it takes advantage of the first branch of the adjoining tree that may be swayed by the blast within its reach; and stretching out its fore-limb, it hooks itself on, and at once transfers itself to what is equivalent to a fresh pasture. The story of the Sloth voluntarily dropping to the ground, and crawling under pressure of starvation to another tree, is one of the fabulous excrescences of a credulous and gossiping zoology." Such, in brief, is a fair estimate of the capabilities of the Ai in a state of nature; and the testimony of such trustworthy travellers as Stedman and Waterton as to its power of rapid motion under certain circumstances, has long placed the matter beyond dispute. "He travels at a good round pace," says the latter, "and were you to see him, as I have done, passing from tree to tree, you would never think of calling him a sloth." In conclusion, we may remark, that the female is furnished with two mammæ, and produces one young at a single birth, which adheres to the parent by its claws until able to shift for itself. The Ai is much sought after by the natives, who consider the flesh to be excellent eating. When on the move it utters a short plaintive cry resembling our pronunciation, in a shrill voice, of the two-lettered name by which it is appropriately called.

THE GIPAKEIOU (*Bradypus torquatus*) is, like the above, a native of the north-easterly districts of Brazil, but it occurs more sparingly. The fur exhibits a frizzled, ferruginous aspect along the under parts of throat and belly; but above it has an orange-yellow colour generally, whilst the face is black and destitute of hair. A more characteristic feature is seen in the presence of a deep black band, forming a sort of collar round the neck; its specific distinctness being rendered still more certain by differences observable in the structure of the cranium, compared with that of other sloths. The habits of the Gipakeiou closely resemble those of the ai.

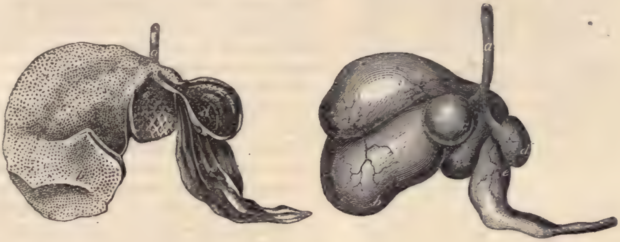
THE UNAU (*Cholœpus didactylus*), or TWO-TOED SLOTH, has been generically separated by Illiger from the above-described species, on account of certain peculiarities in the teeth, associated with a comparative elongation of the head on the one hand, and a shortening of the anterior pair of limbs on the other. The fore-feet are, as above indicated, furnished with only two digits; and the tail, which in the ai is reduced to a mere stumpy appendage, is altogether wanting in the Unau. The first molar teeth of this animal are long, and sufficiently acuminated at the summit to resemble ordinary canines, whilst the superior pair, during the closure of the jaw, are placed in front of the lower ones. Besides these spurious canines, there are fourteen other molars, four on either side above, and three on either side below, the crowns of which are wedge-shaped, that is to say, in their worn condition. In regard to the skeleton, its clavicles are fully developed, and the bones of the carpus and tarsus become very early consolidated together. The Unau is about half as large again as the common ai, whilst the fur exhibits a dark-greyish brown colour generally, being here and there tinged with red. A living specimen of this singular species may be seen in the London Zoological Society's Gardens, Regent's Park.

ORDER IX.—RUMINANTIA.

THROUGHOUT the entire mammalian series, there is not a better defined group than that formed by the ruminating quadrupeds here associated together under the above distinctive title. This was the opinion of the greatest of French naturalists, and it is in no degree contra-indicated by Professor Owen, in whose more exacting system of classification—an outline of which is given at page 8—these cud-chewing species collectively maintain their zoological continuity, as a subordinate division of the even-toed ungulates—more precisely called Artiodactyla.

The essential features by which the ruminants may be distinguished are not confined merely to one or two trifling characters, but involve the structure and morphology of several important organs and appendages. In a few words they may be stated as follows:—All the feet terminate in two digits, the ultimate phalange of each being armed with a tightly investing hoof; and the opposed surfaces of these hoofs are flattened in such a way as to impart to the foot an appearance of splitting in the mesial line. With an exception in the case of the camels, all the species are destitute of incisive teeth in the upper jaw, the vacant space being occupied by a callous pad; the lower jaw is invariably furnished with six incisors, but in all the ruminants not included in the last-named family, the two canines of the lower jaw are closely approximated to the incisors, and, forming a very close resemblance in form and size, are easily mistaken for true incisors. In the typical species, also, there is always a wide unoccupied space intervening between the molars and canines of the lower jaw, while, when the latter are present in the upper maxillary bone, a similar, though somewhat shorter interspace, is correspondingly manifest above. The typical species likewise usually display six molar teeth on each side of either jaw, their flattened crowns being surmounted by two double and irregularly crescent-shaped folds of enamel; the convex outline being directed inwards in the superior series, and outwards below. But the most interesting character by which all the species are noted, consists in the multiple character of the stomach, which is divided into four cavities, so as to provide for the ruminating act (fig. 53). This organ—we say it unhesitatingly—affords one of the most striking illustrations of the special evolution of a complex mechanism from the general or more simple type of structure seen in the majority of mammalia, whilst, to the mind of an unprejudiced truth-seeker, it irresistibly indicates evidence of creative design: and we hold this argument to be in no way lessened by the easily demonstrated fact, that two if not three of its divisions are essentially modified dilatations of the lower end of the œsophagus, A! This is a department of natural history knowledge too important to be slurred over in a work like the present; therefore, before proceeding to explain the ruminating function, we are careful to notice the form and mechanism of this beautifully constructed organism. Most people are aware that the first compartment, B, is called the *paunch*. This is much larger than any of the other so-called stomachs, exhibits a rhomboidal outline rounded at the angles, and occupies no inconsiderable portion of the entire abdominal cavity of the animal. Certain constrictions externally, corresponding with folds of the lining membrane internally, cause this organ, when carefully separated from its other stomachal connections, to assume the appearance of an enormously distended coil of intestine, bent upon itself in the form of the letter S. In the typical ruminants the internal surface is closely beset with villous projections, which impart to the membrane a rough, shaggy aspect, the cogency of which is variously maintained at different parts of the mucous surface; the villi forming small, flattened, prominent, pedunculated masses, in shape resembling racket bats. Such is the general character of the paunch in ordinary ruminants; but in the aberrant cameline genera we find very material differences. Instead of presenting a rugous internal surface crowded with these baton-like villosities, the mucous lining membrane is conspicuously smooth. The most remarkable feature, however, arises out of the formation of numerous pouches, specially fitted for the reception and retention of water (fig. 54). These sacs, which may be looked upon as so many protrusions of the wall of the viscus, are arranged in two distinct groups, one on the right side and the other on the left; the former being by far the more numerous, and, in the full-grown dromedary, measuring about one foot and a half in length and six inches in breadth. The cells of each group are disposed in parallel rows, separated from one another by strong muscular bands, given off from a single large bundle of fibres, which commences at the upper extremity of the paunch, and proceeds in a longitudinal direction, so as to divide the cavity into two compartments. The muscular fasciculi are arranged transversely, and give off secondary bundles at tolerably regular intervals, so that the rounded orifices of each cell are guarded by powerful square-shaped muscular lips. Some of the pouches are more complicated than others, being subdivided into numerous smaller bags by foldings of the internal lining membrane. The largest of the reservoirs in the adult dromedary have, when distended, a depth and width of about three inches. A structure analogous to this is found in the llamas; but it is not so strongly developed. This leads us, in the next place, to describe the second stomach of the ruminants, otherwise called the *reticulum* or water-bag, C (fig. 53). This organ has been regarded by some as a mere appendage of the paunch; but it is as much entitled to a distinctive recognition as any other of these connected viscera. In respect of size, it is comparatively small, presenting a globular outline, and forming a sort of cul-de-sac between the first and third stomachs. Its most characteristic feature is seen in the presence of multitudes of polygonal cells, from which circumstance it has been popularly called the honey-comb bag. In some species, as, for example, in the rein-deer and giraffe,

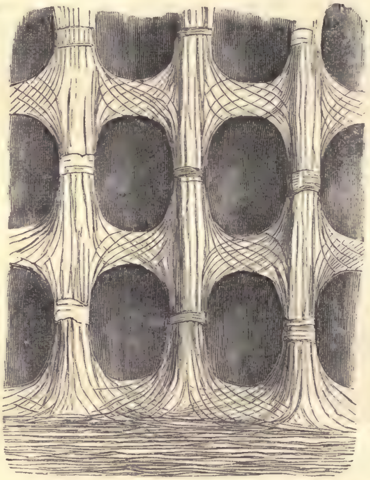
Fig. 53.



Stomach of the Sheep.

these cells are limited by very narrow walls of separation, scarcely elevated above the level of the general surface; and in the horned ruminants the mucous surface is further characterized by a great number of minute and sharply-pointed conical papillæ, occupying every part of the cavity; being most prominently marked along the ridges of the laminæ, so as to give to these slightly-elevated folds of separation a toothed margin. In the camels and llamas the honey-comb cells acquire a form and capacity strictly analogous to the water-cells of the paunch; but there are some slight structural modifications apparently conformable with the more temporary or immediate purposes which they subserve. The apertures of the cells of the paunch, which have been designed to retain water for a lengthened period, are narrow and guarded by productions of the lining membrane, whilst those of the second stomach—destined to be continually parting with their aqueous contents during the ordinary act of rumination—are patent, and not covered in by special membranous folds. Moreover, in the distended state of the cells, the external surface of the paunch is marked by a corresponding number of vesicular bulgings, whereas, in the reticulum, the walls remain uniformly smooth, and do not exhibit on the outside any marked traces of the internal water-cells; nevertheless the compartmental subdivisions are more numerous and complicated than those of the first stomach. Another distinction between the ordinary horned and the non-typical hornless ruminants, may be seen in the absence of any internal cuticular lining membrane in the reticulum of the camels. But we must now pass on to notice the third stomachal viscus. Before doing this, however, we have to remark, that in all ruminants there is situated a short trough-like canal at the superior and anterior margin of the reticulum, constituting the remains, as it were, of that portion of the gullet which has not, according to the developing theory, become involved in the first and second great gastric dilatations. This grooved channel forms a bond of intercommunication between the œsophagus and the three first digestive cavities, and it is furnished with an extension of the muscular tunics of the gullet, so as to fit it for a two-fold office to be presently described. The third stomach, or *manyplies*, D (fig. 53), intervenes between the reticulum and the fourth or true digestive cavity; communicating with the former by a minute aperture, and with the latter by a very wide opening. It is the smallest of the four great stomachal organs; but the extent of its absorbing mucous surface bears no relation to its diminished bulk, seeing that the latter is enormously increased by a remarkable folding of the internal lining membrane whose duplicatures resemble the leaves of a book, whence it is sometimes called the *psalterium.* The leaf-like folds are disposed lengthways, and in the empty condition of the organ are closely applied against each other. In breadth they exhibit proportionate differences, so that we find an alternating assemblage of laminæ presenting three gradations of development; one forming a very narrow fold, another very broad, and a third of intermediate width, serially intercalated between the two. Altogether about forty such septa may be counted in the sheep, and more than double that number in the ox. Internally the surface is beset throughout with small conical eminences, similar in character to the villi of the reticulum; those occupying the free margins of the folds being more conspicuously developed. The manyplies is much elongated in the camels, and considerably larger than the water-bag of the same aberrant group. In all ruminants the fourth stomach, E (fig. 53), constitutes the true digestive cavity, being functionally and morphologically analogous to the simple gastric organ of the non-ruminating mammalia. This viscus is about one-third of the size of the paunch, smooth externally, pyramidal in shape, and terminates by a narrow tubular portion at the inferior or pyloric extremity, at which position the muscular walls acquire increased thickness. Internally the secreting membrane is marked by irregularly disposed longitudinal folds, slightly elevated above the surface, and intercommunicating by smaller foldings of the same nature, having a more or less oblique direction. The lining membrane is soft and smooth, and instead of being provided with villous appendages, is furnished with minute follicular openings leading to gastric glands like those of the human stomach. At the pyloric extremity, in addition to the ordinary narrowing usually seen at this part, there exists a special valvular process, developed from the mucous membrane at the commencement of the duodenum—this structure being evidently designed to guard more effectually the entrance to the intestinal passage. At this point, therefore, we are naturally led to explain the function of rumination, which is characterized by the following phenomena as they successively follow each other under ordinary circumstances:—The food, on being received into the mouth, undergoes a very partial mastication, and in this crude state is speedily

Fig. 54.

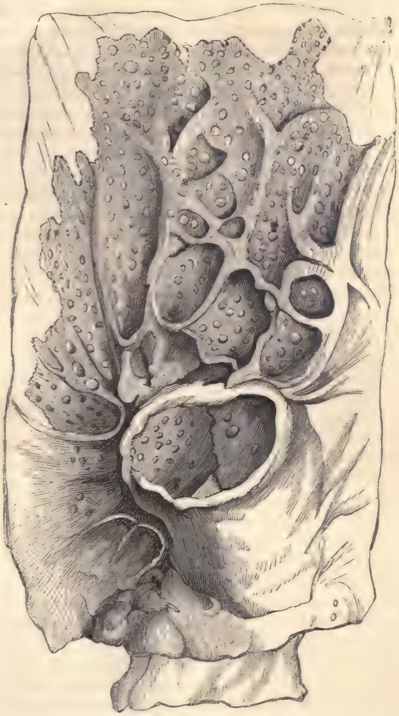


Water-cells in the paunch of the Camel.

carried down the gullet, where, on arriving at the lower part, the lips of the muscular channel, placed at the entrance of the first three stomachs, separate so as to insure its passage into the paunch. In like manner, subsequent to the act of drinking, the margins of the œsophageal groove open, and the water is conveyed into the cells of the reticulum. In the camels a part of the fluid passes into the first cavity, there to be retained by the great water-cells, as a special provision against those contingencies which their mode of existence involves. While the coarse vegetable food is being macerated by the moisture secreted from the walls of the paunch—and probably also from the water taken in by the mouth, some of which may have entered the cavity—portions of the indigestible mass are transmitted into the second stomach for further maceration, and from thence into the grooved canal above described, to be here moulded into the form of pellets, and returned to the mouth by a kind of reversed peristaltic action. The softened bolus thus brought back into the mouth, is destined to receive a thorough and complete remastication, constituting that part of the process familiarly termed "chewing the cud." This phenomenon is accompanied with an action of the jaws which differs somewhat in particular species. Thus, it has been shown by Professor Owen that in the camels the bolus is triturated alternately from side to side; whereas the action of the teeth in the horned ruminants, including the giraffe, is always in one direction—it may be from right to left or left to right—occasioned by the rotatory motion of the jaw. The necessary reduction of the aliment having been accomplished, it is again transferred to the stomach in a pulpy semifluid condition; but this time, instead of entering the first or second cavities, it passes directly along the now-closed œsophageal groove into the third stomach, or manyplies. In this viscus the superfluous moisture is supposed to be absorbed before the bolus is ultimately transmitted into the fourth stomach, in which organ the true digestive act remains to be fulfilled. In the newly-born ruminant, the first, second, and third stomachs are very incompletely developed; and no chewing of the cud being necessary, the food passes uninterruptedly into the fourth. In the calf a peculiar organic acid is secreted by the lining membrane of the true stomach, which, it is well known, possesses the singular power of converting the albumen of milk into curd and whey. In the young, as well as in the adult animal, various foreign substances are occasionally found in the paunch, and sometimes in the reticulum. The concretionary masses are either made up of hair, vegetable fibres, or calcareous particles, generally agglomerated together in a rounded or oval form. The hairy balls found in the calf and cow result from the licking of their own hides, or those of others; and the individual hairs, on being transferred into the stomach, are collected together, and rolled by the action of this organ into the characteristic shapes above mentioned. In the camel we find them in the form of pedunculated pellets, strung together in grape-like bunches. In the chamois, the formation of the so-called bezoar stones, takes places in consequence of a partiality for saline matters, which the animal gratifies by licking fragments of rock containing saltpetre. Thus a variety of earthy and silicious particles are at the same time swallowed, and by the secretions and peristaltic action of the stomach, are agglutinated together, and converted into curious pebble-like formations.

Before leaving this part of the subject, we deem it right to notice our discovery of two very remarkable peculiarities occurring in the alimentary canal of the aberrant genus Camelopardalis. The first of these consists in the presence of pouch-like folds in connection with the compound glands of the intestine; whilst the second is a similar, but far more striking development of the glands, situated close to the opening by which the small intestine communicates with the large colon and cœcum. This structure we believe to be altogether unique throughout the entire mammalian series; and although we first directed attention to it at the Glasgow meeting of the British Association in 1855, and have subsequently given details in the third volume of the new series of the *Edinburgh Philosophical Journal*, and in the article "Ruminantia," published in Dr. Todd's "Cyclopædia of Anatomy and Physiology," we make no apology for again specially inviting the atten-

Fig. 55.

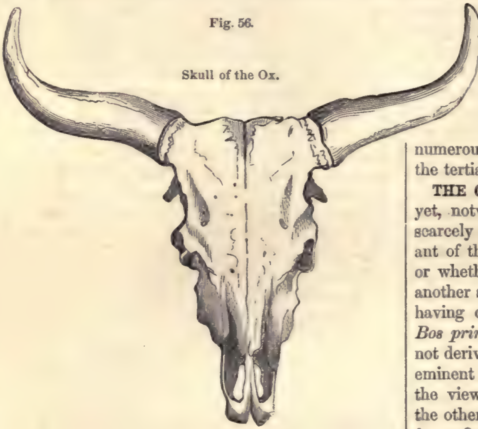


Remarkable compound gland situated at the junction of the large and small intestines of the Giraffe.

tion of naturalists to so interesting a structure (fig. 55). Here we have an intestinal gland, made up as it were of from fifteen to twenty little pouches, combined to form a beautiful network of cells, seven of them bearing no inconsiderable resemblance to the water-carrying reservoirs of the reticulum. These latter have a depth of from three to four lines, whilst the remainder are more or less incomplete; and those farthest from the ileo-colic orifice are mere depressions, the walls of separation being scarcely elevated from the surface. In other ruminants the only peculiarity affecting the alimentary canal, which is worthy of notice, consists in the remarkable lengthening of the intestinal tube generally, and in the bulky development of the cœcum. There are some curious modifications of structure to be seen in the liver and gall-bladder; but these distinctions will be more appropriately indicated when comparing and describing the several characteristics of the cameline and cervine families.

The skeletal characters are tolerably uniform throughout the order, except in so far as they relate to mere size and strength, and to the presence or absence of those remarkable cranial outgrowths, commonly called horns. We shall treat of the latter structures when specially considering the horned families. Meanwhile we take occasion to notice, that whatever be the length of the vertebral column, we invariably find the bones of the neck to be only seven in number; and the beauty of this law, though previously mentioned as affecting the entire mammalian series, cannot be more cogently illustrated than by comparing the long-necked camels and giraffe with the short-necked cetacea—which have yet to be described. Taking the skull of the ox (fig. 56) as a type of the ruminant cranium, it is only necessary to observe its general breadth and massiveness; the cerebral division bearing a very small proportion to the entire mass. This disparity prevails throughout the whole order, the bones of the face occupying fully two-thirds of the entire length, and the area of the face on section being nearly double that of the cranium.

Fig. 56.



Skull of the Ox.

Family I.—BOVIDÆ.

The group of animals commonly termed Oxen constitute a division of the hollow-horned ruminants, which, although very closely allied to the sheep and antelopes, are easily recognized by their bulky and massive appearance generally, and particularly by their broad muzzle and powerful limbs. A still more striking characteristic is to be seen in the lateral direction of the horns, which usually incline upwards, or forwards in a crescentic manner. In the constitution of the skeleton, there are numerous variations in the form, position, and degree of development of the several osseous elements; but these are not of sufficient importance to be detailed at length. In regard to the cloven hoof, we may mention what we have omitted in our general introduction to the order, namely, that this split condition of the foot is evidently designed to impart lightness and elasticity to the spring; and in view of giving full effect to such an arrangement, many ruminant species are provided with a special glandular sebaceous follicle between the toes, whose office it is to furnish a lubricating secretion, calculated to prevent injury from friction of the digits one against the other. According to Sir Charles Bell, there is yet another intention in this cloven form, viz., that of aiding the voluntary elevation of the foot, when it has sunk deeply into the soft ground. "We may observe," he says, "how much more easily the cow withdraws her foot from the yielding margin of a river than the horse. The round and concave form of the horse's foot is attended with a vacuum or suction as it is withdrawn, while the split and conical-shaped hoof expands in sinking and is easily extricated." In regard to the economic purposes which this family subserves, they are not second to those of any other group of animals, for they supply us with capital in the form of labour, fat, milk, leather, horns, &c. Geographically, they enjoy a wide distribution, both in the eastern and western hemispheres; whilst numerous fossil remains testify to their abundance in the tertiary epoch.

THE OX (*Bos taurus*) is known to every one, and yet, notwithstanding our familiarity with it, we are scarcely in a position to decide whether it is a descendant of the great ancient British wild ox—*Bos urus*—or whether it may not be a domesticated variety of another species. We incline to the latter opinion; and having ourselves carefully examined the cranium of *Bos primigenius*, we are quite satisfied that the Ox is not derived from *that* source. Cuvier, Bell, and other eminent naturalists have expressed their opinion that the view first referred to is the correct one; but, on the other hand, we have the weighty authority of Professor Owen, whose sentiments are thus convincingly expressed:—"It seems to me more probable," he says, speaking of our domestic cattle, "that the herds of the newly-conquered regions would be derived from the already domesticated cattle of the Roman colonists; of those 'boves nostri,' for example, by comparison with which Cæsar endeavoured to convey to his countrymen an idea of the stupendous and formidable uri of the

Hercynian forests. The taming of such a species would be much more difficult than the importation of the breeds of oxen already domesticated and in use by the founders of the new colonies. And that the latter was the chief, if not the sole source of the ox of England, when its soil began to be cultivated under Roman sway, is strongly indicated by the analogy of modern colonies. The domestic cattle, for example, of the Anglo-Americans have not been derived from tame descendants of the original wild cattle of North America; there, on the contrary, the bison is fast disappearing before the advance of the agricultural settler, just as the auroch (*Bison priscus*) and its contemporary the urus have given way before a similar progress in Europe." Professor Owen believes that no living descendant of *Bos urus* exists on the habitable globe, and that it is only known to us by its fossil remains; but there is reason to suppose the auroch and European bison to be identical. Be this as it may, the common ox is specifically recognized among existing forms by its flat forehead; the horns being placed at the two extremities of a prominent crest, which separates the forehead from the occiput. All our domesticated cattle—so widely scattered over the face of the earth—are derived from this species; the various celebrated breeds representing so many more or less permanent types of variation. Oxen, although usually slaughtered for food before many years have elapsed, are capable of attaining an age of twenty-five years and upwards. It is somewhat singular that the cow should have a period of gestation precisely equal in duration to that of the human female, namely, two hundred and eighty days. The calf at the time of birth displays incisive and canine teeth in the upper jaw; but, as has been previously hinted, the fall of the milk teeth leaves the upper jaw destitute of these organs in the adult animal; their place being supplied by the development of a thick callous pad.

THE EUROPEAN BISON (*Bison Bonassus*) appears, as we have already stated, to be identical with the great fossil auroch, or *Bison priscus* of Owen. At one time it was common in Germany and the south of Sweden; but at the present day it occupies a comparatively restricted range, being found only in the forests of Lithuania, Moldavia, Wallachia, and the Caucasus. "These animals," says Mr. Broderip, "have never been domesticated, but herds of them are protected in certain localities in the forest of Bialowieza in Lithuania, under the direction of the Emperor of Russia. There are twelve herds thus kept, each herd being under the superintendence of one herdsman. The estimated number of all the herds is eight hundred. They feed on grass and brushwood, and the bark of young trees, especially the willow, poplar, ash, and birch. They do not attain their full stature till their sixth year. They are very shy, and can only be approached from the leeward, as their smell is exceedingly acute. When accidentally fallen in with, they become furious, and passionately assail the intruder. When taken young they become accustomed to their keeper; but the approach of other persons excites their anger. Two young specimens were presented to the Zoological Society of London by the Emperor of Russia. Though it had been stated that the auroch had a natural enmity to domestic cattle, and that the young obstinately refused to be suckled by the domestic cow, the calves sent by the emperor were suckled by a cow in the Regent's Park Gardens, and very speedily became attached to their foster-mother. These creatures unfortunately died a few months after they had been brought to this country." The bisons, generally, are distinguished from oxen by their horns, which take origin in front of the so-called occipital ridge, and by the convexity of the forehead; they have also fourteen pair of ribs, being a pair in excess of the number found in the ox. The limbs of the auroch are also comparatively long; its voice has the character of a grunt, and the dusky-brown fur is curled and woolly, especially in the region of the neck, where it is profuse, forming a sort of beard under the chin and throat. By some naturalists, the Caucasian variety is thought to be a distinct species; but this is exceedingly doubtful.

THE AMERICAN BISON (*Bison Americanus*) or BUFFALO—Plate 18, fig. 59—is generally admitted to be distinct from the above, yet it must be confessed that the two species very closely resemble each other. So far as the form of the skull, the horns, the fur, and the bulk of the animal are concerned, there is little or no difference; but the limbs and tail are comparatively short, and, according to Mr. Blyth, it is provided with an additional pair of ribs. The buffalo is an inhabitant of all the temperate parts of Central and North America, and at a period not very far back, but anterior to the rise of civilization in that country, this fine animal roamed at will throughout the length and breadth of the continent—at least from the Atlantic to the Pacific, excepting the extreme northern and southern latitudes. It has never existed in South America, neither indeed has any other member of the bovine family, unless previously introduced by European colonists. At the present time they range over the wild prairies of the far west; but, like the diminishing tribes of human kind who dwell in those distant regions, it is evident that their numbers are becoming "small by degrees and beautifully less." Notwithstanding our satisfaction at seeing civilization extending to the remotest corners of the habitable globe, there is something melancholy in reflecting on the past history of these animals, associated as it is with the coeval disintegration of ancient peoples, to whom, indeed, the buffaloes have all along afforded a principal means of subsistence. These animals are still very numerous on the plains watered by the Saskatchewan River, being found as far north as Slave Point. Much has been written respecting their habits and the different modes in which they are captured by the native Indian tribes; and most of us remember the stirring and beautiful illustrations exhibited in this country by Mr. Cattlin, in whose "Letters and Notes on the North American Indians" abundant information is given about these imposing creatures. Catesby, Washington Irving, Sir John Franklin, Sir John Richardson, and others, supply most interesting particulars; but we have space only to give a few notices from the two last-mentioned authors. The latter affords us a condensed view of what has been previously written in regard to the habits of the bison, and says that they "wander constantly from place to place, either from being disturbed by hunters or in quest of food. They are much attracted by the soft tender grass which springs up after a fire has spread over the prairie. In winter they scrape away the snow with their feet to reach the grass. The bulls and cows live in separate herds for the greatest part of the year, but at all seasons one or two old bulls generally accompany a large herd of cows. In the rutting season the males fight against each other with great fury, and at that period it is very dangerous to approach them. The bison is, however, in general, a shy animal, and takes to flight instantly on winding an enemy, which the acuteness of its sense of smell enables it to do from a great distance. They are less wary when they are assembled together in numbers, and will then often blindly follow their leaders, regardless of, or trampling down the hunters posted in their way. It is dangerous for the hunter to show himself after having wounded one, for it will pursue him; and although its gait may appear heavy and awkward, it will have no difficulty in overtaking the fleetest runner" Sir J. Richardson then proceeds to mention the case of a Mr. M'Donald, who one evening went out to look for game. "It had become nearly dark when he fired at a bison-bull which was galloping over a small eminence, and as he was hastening forward to see if his shot had taken effect, the wounded beast made a rush at him. He had the presence of mind to seize the animal by the long hair on its forehead as it struck him on the side with its horn; and being a remarkably tall and powerful man, a struggle ensued, which continued until his wrist was severely sprained and his arm was rendered powerless. He then fell, and after receiving two or three blows became senseless. Shortly afterwards he was found by his companions lying bathed in blood, being gored in several places; and the bison was couched beside him, apparently waiting to renew the attack had he shown any signs of life. Mr. M'Donald recovered from the immediate effects of the injuries he received, but died a few months afterwards." Of the various modes of taking the American buffalo, none display the courage and dexterity of the Indian so much as that of hunting them on horseback. "An expert hunter," says Sir John Franklin, "when well mounted, dashes at the herd, and chooses an individual which he endeavours to separate from the rest. If he succeeds, he contrives to keep him apart by the proper management of his horse, though going at full speed. Whenever he can get sufficiently near for a ball to penetrate the beast's hide he fires, and seldom fails of bringing down the animal; though of course he cannot rest the piece against the shoulder, nor take deliberate aim. On this service the hunter is often exposed to considerable danger from the fall of his horse in the numerous holes which the badgers make in these plains, and also from the rage of the buffalo, which, when closely pressed, often turns suddenly, and rushing furiously on the horse, frequently succeeds in wounding it or dismounting the rider. Whenever the animal shows this disposition, which the experienced hunter will readily perceive, he immediately pulls up his horse and goes off in another direction." The most powerful adversary of the buffalo is the great grisly bear, whose strength is sufficient to crush the largest bull. A full-grown male will weigh as much as two thousand pounds, although an ordinary specimen comes considerably below this amount. The body is about eight and a half feet in length, from the tip of the muzzle to the root of the tail.

THE CAPE BUFFALO (*Bubalus Caffer*) is a native of South Africa, where it is known by several other names, such as the CAPE OX, the BUFFEL, and the BOKOLOKOLO, the latter title being that employed by the Bechuanas. It occurs in large herds in the plains and forests of the interior. It is an extremely heavy and powerfully built species, a full-grown specimen weighing as much as five and forty stone or upwards. The body is, in some individuals, nearly nine feet in length, exclusive of the tail, which is three feet long, terminating in a tuft of coarse black hair, reaching below the hocks. The fur exhibits a leaden-black colour. The horns are massive; very broad at the base, where they are closely approximated; and spreading from thence, horizontally, are turned upwards and inwards at the tips, which are separated from each other by an interspace of about four feet. Respecting the habits of the Cape buffalo, the early travellers, Thunberg and Sparrmann, give us some interesting data; and from their observations, and that of several later writers, these animals appear to be most formidable antagonists. Their ferocity when wounded is perfectly frightful. The herds are usually found grazing in the immediate vicinity of some large wood; in numbers varying from twenty or thirty up to at least five hundred. Their behaviour, when fired upon, seems to vary according to circumstances. Captain Harris having fallen in with a herd, thus briefly describes their conduct:—"Creeping close upon them, I killed a bull with a single ball; but the confused echo reverberating among the mountains alarming the survivors, about fifty in number, they dashed panic-stricken from their concealment, ignorant whence the sound proceeded; and everything yielding to their giant strength, I narrowly escaped being trampled under foot in their progress." Mr. Andersson's account of an encounter with these animals is very animated:—"A herd of buffaloes," he says, "at least two hundred in number, suddenly rushed past us with the violence of a tornado, breaking down and crashing everything that opposed their headlong career; and raising so great a cloud of dust as nearly to conceal their dark forms from view. I fired into the midst of them at random, and had the satisfaction to see a cow drop to the shot. The report of the rifle brought the whole herd almost immediately to a stand, and facing round, they confronted us in one dark mass. Taking advantage of a tree at some little distance ahead, I stalked to within about one hundred and fifty paces of this formidable phalanx. Resting the gun on a branch, I took a steady aim at the leading bull; but though I very distinctly heard the bullet strike him, he did not flinch in the slightest degree. One of the natives having by this time mustered courage to steal up to me with my rifle, I fired a second time, though at another of the herd, but with no better result. Six several times at the least, did I repeat the dose; and though on each occasion the ball told loudly on the animal's body, neither it nor any one of the herd, strange as it may appear, budged an inch! They seemed to be chained to the spot by some invisible power, eying me all the while with an ominous and sinister look. Their strange and unaccountable bearing, puzzled me beyond measure. I expected every instant to see them charge down upon me. But even had this happened—though I am free to confess I felt anything but comfortable—my personal safety would not, perhaps, have been much endangered, as by ascending the tree against which I was leaning, I should have been out of harm's way. However, I was not driven to this extremity; for, whilst about to ram down another ball, the whole herd suddenly wheeled about, and with a peculiar shrieking noise, tails switching to and fro over their backs, and heads lowered almost to the ground, they made off at a furious pace." From an examination of the ground where they stood, and by information received from the bushmen, Mr. Andersson subsequently ascertained that two of the animals had been mortally wounded.

THE INDIAN BUFFALO (*Bubalus arna*) is another huge species, the body measuring ten and a half feet from the extremity of the muzzle to the root of the tail. In the wild state it is called the *Arna;* but the tame variety, so common throughout India, is termed the *Bhainsa.* The wild buffalo lives in large herds, and inhabits the marshy swamps and low grounds in the immediate neighbourhood of large forests. It is readily recognized by the uniform shortness of the tail; by the tufts of hair which protect the forehead and knees; and chiefly by the enormously developed horns, which are particularly long and directed backwards in one variety, and much curved and spread out laterally in another. Like its congeners, the Arna is celebrated for its ferocity. "He seems to look with disdain on every living object, and to rely on the great strength he possesses to overthrow whatever may be opposed to his rage. The smallest provocation irritates him incredibly! And such is his courage that he will sometimes even attack a group of elephants going for fodder. I do not think," says Captain Thomas Williamson, "there can be a more menacing object than a single wild buffalo disturbed from wallowing in the mud." This is a propensity to which they are very much given; and it is one which, associated with certain external characters—such as the thickness of the skin, its scanty covering of hair, &c.—serves to demonstrate a partial alliance of the buffaloes to the true pachydermatous mammalia. We cannot here, however, enlarge upon this topic. In the wild state the Indian buffalo proves a most terrible opponent, not only to the elephant, but to the tiger also. One of the principal sources of entertainment given—on anniversary celebrations and such like occasions—by the Indian families of distinction, has ever consisted in affording a display of the cruel ferocity of the tiger and buffalo. We have neither space nor inclination to describe these desperate encounters at any length; but we quote a few observations in order more particularly to show the behaviour of the animal under consideration. "The buffalo, on entering the area, smells the tiger, and becomes instantly agitated with eagerness. His eyes sparkle with fury, as they quest around for the skulking enemy, which is generally attacked the instant it is distinguished. The buffalo, shaking his head and raking the ground for a few seconds with his foot, places himself in the posture of attack; and with his face brought parallel to the surface, his horns pointing forward, and his tail indicating both his determination and his vigour, rushes forward at his full speed." Such is the attitude this beast usually assumes when charging an enemy; and we can readily understand the amount of presence of mind necessary for any human being who may chance to become an object of resentment. A remarkable display of this mental discipline is recorded by Captain Williamson, in the case of a Dr. Knight, when out shooting in the neighbourhood of Daudpore. "A buffalo bull, which was at a considerable distance, after shaking his head and stamping with his fore-foot, at length fairly made at the doctor, who was fortunately provided with an excellent rifle, of a large bore. The doctor, knowing what sort of a business it was likely to prove if he awaited the buffalo's arrival, mounted a smart tanian or hill pony, which was led by his syce or groom, and made off towards a very heavy cover, and had time to conceal himself. The buffalo passed on after the doctor, who did not fail to give Punch (which was the horse's name) every provocation to exertion. His speed did not, however, equal that of his pursuer, which, though appearing to labour much, took immense strides, and was fast coming up. The doctor, finding it impossible to escape in this way, reined up suddenly, and dismounted. He had scarcely time to turn his horse's flank, and to level his rifle over the back of the saddle, before the buffalo, being within the usual distance, lowered his head and commenced the charge. The doctor, who was a remarkably good shot, fired, and happily lodged the ball between the horns of the animal; which, though killed outright, did not drop until within three or four yards of Punch's side." In conclusion, we may remark that the female Arna, after a gestation of ten months, produces one or two calves in the middle of summer. The tame buffalo, introduced into Italy so early as the seventh century, is a true variety of this species. As a beast of burden it possesses numerous advantages over the solidungulate horses, being able to traverse muddy swamps two or three feet in depth with comparative facility. This animal is also much valued for its strong leathery hide; but as a source of food it is much inferior to that of ordinary cattle.

THE ZEBU (*Bos Indicus*) is one of those animals with whose existence every reader of oriental history is familiar. Regarded with veneration, and even worshipped, the Zebu, or Brahmin bull, seems to lead a happy life; wandering to and fro from village to plain, grazing where it will, or receiving the votive offerings of the devout. Even its excrement is esteemed sacred; the dried dung being used for fuel in cooking food—upon which it is supposed by the natives to exert some beneficial influence—and also employed in deciphering objects on their filthy walls. The Zebu is easily recognized by its convex forehead, immense chest and dewlap, and more particularly by a remarkable hump on the shoulder, which, like the analogous formation seen in the dromedary, consists entirely of fat. Some kinds are provided with short, widely separated horns, but in certain varieties these appendages are entirely wanting; in others, again, and these are the most common, the horns attain considerable development. This species varies exceedingly both in respect of size, and in the colour of the hide; generally speaking, the fur is greyish-white, and ash-coloured. The Zebu is not only found in India, but is also met with in Persia, Arabia, and even in Africa. It is in many places employed in harness to draw light vehicles, and also as an ordinary beast of burden for harder work. Its flesh, though far superior to that of the species last described, is not considered equal to that of the common ox. The hump is regarded as a delicacy; its choiceness depending apparently more on the manner in which it is served up, than upon any inherent virtue in the fatty mass itself.

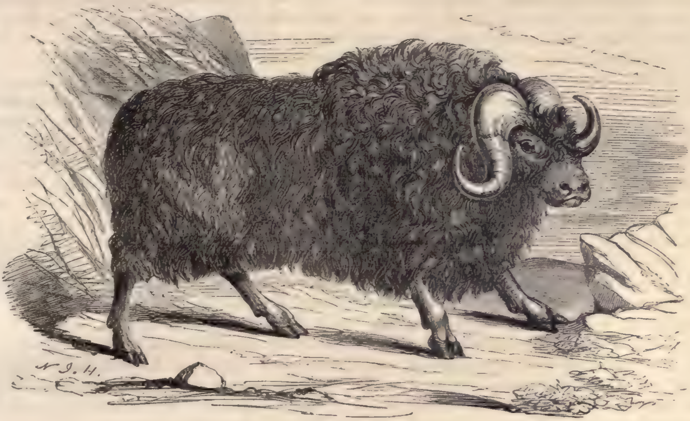
THE GYALL (*Bos frontalis*), or JUNGLE OX, is about the size of a large bullock. Considerable difference of opinion has all along existed respecting its origin. By some it has been regarded as a cross breed between the Indian buffalo and certain varieties of the zebu, and by others as altogether distinct. Be this as it may, it is a well-marked form, and is distinguished more especially by the horns, which are short and thick, flattened from before backwards, and directed laterally with a slight inclination upwards. The Gyall is found in the mountainous districts of north-eastern India, and, as a domestic race, appears to thrive most satisfactorily in the province of Chittagong. According to Mr. Lambert, the bull is naturally very bold, and will defend himself against any of the beasts of prey. "The female differs little in appearance; her horns are not quite so large, and her make is somewhat more slender. She is very quiet, and is used for all the purposes of the dairy, as also for tilling the ground; and is more tractable than the buffalo." The fur exhibits a blackish-brown colour generally; whilst the length of the body, from the tip of the muzzle to the root of the tail, is upwards of nine feet. One variety of this species, termed the ASSEEL GYAALL, is regarded by some as the progenitor of the variety under consideration. It is provided with longer horns, which are strongly curved throughout, the space between the tips measuring about fourteen inches. Over the shoulders there is a considerable elevation; but it does not acquire the significance assigned to it in the humped varieties of cattle. It is not at all ferocious, even in its wildest condition. It frequents the neighbourhood of forests, cropping shoots and leaves of shrubs in preference to grass.

THE GOUR (*Bos Gaurus*) is by some considered to be a distinct species. It is a bulky animal, measuring, according to Dr. Traill, very nearly twelve feet from the tip of the muzzle to the end of the tail. The Gour inhabits certain mountainous districts of Central India, being particularly abundant on the Mysa Pat mountain in the district of Sergojah. It occurs in herds of from twenty to thirty and upwards, which, like the gyalls, prefer to browse on leaves and tender shrubs—a marked peculiarity, which militates rather against the statement of Dr. Traill, that the habits of these two species are different, and, in our view, lessens the value of his persuasion, that these two animals are specifically distinct. However, the Gour is an important kind of ox. It is a formidable opponent in combat, and is said to be more than a match for the tiger. According to Mr. Hodgson it is with great difficulty reared in a state of confinement.

THE YAK (*Bos poëphagus*) or GRUNTING OX, is a native of Thibet, where it is found both in the tame and wild state, inhabiting "all the loftiest plateaus of high Asia between the Altai and the Himalaya, the Belur Tag, and the Peling mountains." It is a comparatively small species, and readily distinguished by its small mane on the back, and more especially by the tail, which is clothed with long hair like that of a horse. This appendage, duly prepared and sometimes dyed, is highly valued as an article of trade, and is sold to the Chinese, Turks, and other eastern nations, who employ it as an ornamental badge of distinction usually attached to their caps or turbans. Several varieties of the Yak are known, and employed for different purposes. Hofmeister, in his "Travels in Ceylon," speaks of the Yak oxen as very beautiful animals. Whilst being ridden they were shy, restless, and apparently disposed to attack their riders. "As the steepness increased," he says, "these poor animals began to moan, or rather grunt, in the most melancholy manner; and this unearthly music gradually rose to such a violent rattle, that, driven rather by its irksome sound than by the discomfort of our saddleless seat, we dismounted at the end of the first half hour." The fur of the Yak is usually black, the back and tail being sometimes quite white. Various cross breeds have been produced between this species and the common ox.

THE MUSK OX (*Ovibos moschatus*) is a native of the icy regions of North America, and is in those districts an exceedingly valuable animal, supplying the Esquimaux with one of their principal sources of food. It is readily distinguished, not only by its moderate bulk, but also by its long-haired, woolly hide (fig. 57). The ears are short, and well-nigh concealed by the fur. The horns are remarkably broad at the base, where they closely approximate, separated by a hairy interspace in the female. They are curved obliquely downwards at first, suddenly bending upwards again towards the tips. The first half of the horn is rough and light-coloured; but the remaining narrowed portion is smooth and black at the extremity. The forehead is convex, the face being prolonged forwards into a hairy muzzle. The long fur has a rich brown colour generally, but is whitish on the limbs, where it is not so fully developed. The best account of the habits of this animal is that of Sir John Richardson, who writes as follows:—"Notwithstanding the shortness of the legs of the Musk ox, it runs fast; and it climbs hills and rocks with great ease. One pursued on the banks of the Copper-mine, scaled a lofty sand cliff, having so great a declivity that we were obliged to crawl on hands and knees to follow it. Its footmarks are very similar to those of the carabou, but are rather longer and narrower. These oxen assemble in herds of from twenty to thirty, rut about the end of August and the beginning of September, and bring forth one calf about the latter end of May or beginning of June. Hearne, from the circumstance of few bulls being seen, supposes that they kill each other for the cows. If the hunters keep themselves concealed when they fire upon a herd of Musk oxen, the poor animals mistake the noise for thunder, and, forming themselves into a group, crowd nearer and nearer together as their companions fall around them; but should they discover their enemies by sight, or by their sense of smell, which is very acute, the whole herd seek for safety by instant flight. The bulls, however, are very irascible; and, particularly when wounded, will often attack the hunter, and endanger his life, unless he possesses both activity and presence of mind. The Esquimaux, who are well accustomed to the pursuit of this animal, sometimes turn its irritable disposition to good account; for an expert hunter, having provoked a bull to attack him, wheels round it more quickly than it can turn, and by repeated stabs in the belly puts an end to its life." The Musk ox is most abundant in comparatively inaccessible districts, where rocks and craggy slopes, unadorned with trees, seem to form its special home. If it could be more easily procured, the woolly fur, finer than that of the bison, would be much more extensively employed for economic purposes. According to an authority recently quoted, the carcass of the Musk ox, exclusive of the offal, weighs about three hundredweight. When well fattened, the flesh of the cow has a tolerably pleasant flavour; but that of the males or females, when lean, has a musky taste, and is both tough and highly coloured. We have said that the foot-prints of this animal can scarcely be distinguished from those of the reindeer; but according to the experience of Mr. Peterson, who accompanied Dr. Kane on his arctic travels, those of the ox are much larger, but not wider. Behind the prints there were slight brushings of the snow, caused by hair growing from the pastern joints.

Fig. 57.



The Musk Ox (Ovibos moschatus).

FAMILY II.—ÆGOSCERIDÆ.

Partly for convenience sake we here associate under the above title the closely allied genera represented by the sheep and goats. It is admitted that, in a purely zoological or anatomical point ot view, it is difficult to impart a separate family definition to this group; nevertheless there is a *tout ensemble* about these animals which, in our opinion, justifies such a step. Even the most superficial observer cannot fail to notice a very marked difference in the general aspect of these creatures, when compared with oxen properly so called. The goats are characterized chiefly by their long horns, which are directed upwards and backwards, are more or less angular in front, rounded behind, and generally marked by transverse bars or ridges. The chin is clothed with a long beard. On the other hand, the sheep, which have no beard, have the horns directed at first backwards, and subsequently bent spirally forward. None of the members of this family exhibit the lachrymal sinuses, so characteristic of the majority of the antelopes and deer. The value of these animals to man is too well known to require lengthened comment.

THE SHEEP (*Ovis aries*).—Any attempt to enumerate or describe the principal varieties of sheep would, in a work like the present, be quite out of place. It is impossible to determine with certainty how many species of sheep exist; but there is reason to believe that all the forms may be reduced to one or two original species. Our domesticated breeds are supposed to be derived from the Mouflon (*Ovis musimon*), which is found in Cyprus, Candia, Corsica, and Sardinia. How far this affects the question of the specific identity of such kinds as the Thibet sheep (*O. ammon*), Plate 18, fig. 60, the Argali of Central Asia (*O. argali*), and the Rocky Mountain sheep (*O. montanus*), Plate 18, fig. 61, of North America it is not easy to decide. From the earliest ages of human history the sheep has been employed in the service of man, affording him food and materials of clothing, &c. Now-a-days they supply us with meat, suet, leather, wool, tallow, and manure; the latter substance indirectly conferring many other advantages, by proving a source of fertility to various crops of grain and fodder. Among the more interesting varieties we may particularize the Fat-tailed sheep of Persia, Tartary, and China, whose caudal appendage is transformed into a globular mass of fat weighing as much as sixty or seventy pounds. Another interesting form is the *Ovis polyceratus*, inhabiting Nepaul; the male being provided with four horns. These last-mentioned organs attain an enormous development in the Rocky Mountain sheep—Plate 18, fig. 61—each of them measuring nearly three feet along their outer curvature, from base to apex. In the catalogue of ovine ruminants preserved in the British Museum upwards of thirty well-marked varieties of sheep are indicated, and this enumeration does not separately take into consideration the multitudinous sub-varieties, or domesticated breeds, which are found in the United Kingdom, and in various parts of Europe.

THE WILD GOAT (*Capra œgagras*), or Paseng, is believed to be the progenitor of our domestic goats, in the same way that the Mouflon is supposed to be the original stock of our sheep. The Paseng is a native of the mountains of Persia and the Caucasus, and is distinguished by its sharp horns, which attain a very large size in the male. The varieties to which it is believed to have given origin are exceedingly numerous; the various kinds differing not only in form, size, and colour, but also in the character of their hairy covering, and in the number and disposition of their horns. The Angora variety has beautiful long silky hair; whilst the wool of the Thibetan goat supplies the natives of India with material for the fabrication of the celebrated cashmere shawls. The female, after a period of five months' gestation, usually produces two young at a birth. Though goats are chiefly valued for their skins, the milk of the female, and especially the flesh of the kids, are highly esteemed. The Rocky Mountain goat (*Capra Americana*) is possibly a mere variety of the common wild species.

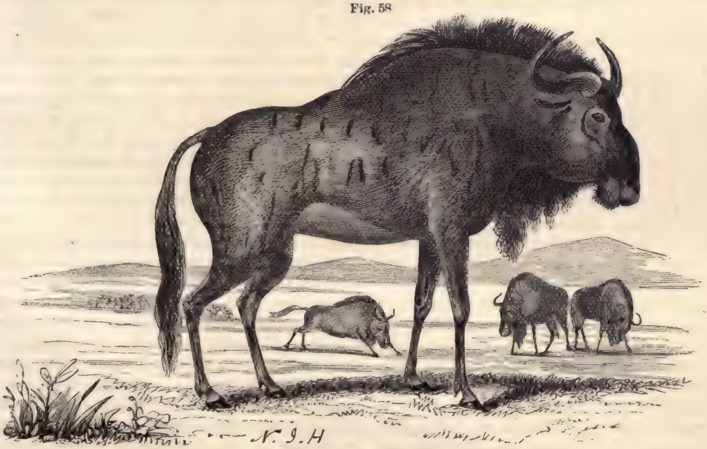
THE IBEX (*Capra ibex*), Plate 19, fig. 62, is a native of the Swiss Alps, and probably of the mountainous chains of Southern Europe generally. It is provided with immense horns, which are arched backwards, and marked with prominent node-like rings throughout their entire length. The Ibex or steinboc, as it is sometimes called, is subject to great difference, those examples found in the Caucasus and in Asia being, in all likelihood, mere varieties, although they are described by some as distinct species. The Ibex is a very hardy animal, and is said to leap fearlessly down rocky precipices, falling on its massive and partially elastic horns, which afford the necessary security against injury.

FAMILY III.—ANTILOPIDÆ.

By far the greater portion of the hollow-horned ruminants belong to this family, in which the osseous axis of the horns is solid, persistent, and destitute of cavities or pores. A large number of the antelopes possess lachrymal sinuses or tear-pits, in common with the deer tribe. The horns have usually a more or less conical form, cylindrical, sometimes compressed, annulated at the base, and directed obliquely backwards. These appendages are usually two in number, simple and unbranched; but in some cases there are four horns, as, for example, in the Jungliburka and Chousingha, whilst those of the Cabrit have an additional prong. This may be considered as equivalent to the brow antler of the deer, and clearly indicates an approach towards the cervine type of ruminant. Most of the antelopes are remarkable for their very graceful and slender build; the structure of their limbs being beautifully adapted for rapid flight. They are widely distributed throughout the eastern hemisphere, being more particularly abundant in Africa, where vast herds of them supply the natives with food, and too often afford the European hunter an aimless pastime—in those cases where they are shot for mere sport only. Like the generality of ruminants they are, for the most part, gregarious in their habits.

THE GNOO (*Catoblepas gnu*)—Plate 19, fig. 63—is a native of South Africa, and forms an aberrant type between the bovine and the antilopine ruminants; but its more distinctive characters undoubtedly indicate a closer alliance to the present family. The body is nine and a half feet in length, and stands about four feet six inches at the shoulder. The muzzle is large, bristly, broad, and square-shaped, the nasal apertures being operculated. The horns are broad at the base, where they expand into a broad protecting plate on the forehead; from this point they are directed downwards and slightly outwards over the eyes, and then making a regular curve upwards terminating in a sharp hooked extremity. The chin is furnished with a thick beard, similar tufts of black hair being situated below the eyes. A flowing whitish mane extends along the neck, from the occiput backwards to a point beyond the withers. The ears are comparatively small. The tail resembles that of a horse, has a white colour, and reaches to the ground. Between the fore-legs and along the central line of the thorax, the brisket is clothed with a thick shaggy development of black hair. The general colour of the fur is that of an amber-brown, passing into brownish-black. The limbs are particularly slender, terminating in bluish-black hoofs, which are pointed and compressed anteriorly. The udder of the female is provided with four mammæ. The habits of the Gnoos are gregarious, and they are exceedingly wild and swift of foot, following one another in single file, and skimming the plains with extraordinary velocity; they are extremely restless, seldom remaining long at one spot, and migrating from place to place in vast herds. Captain Harris, from whose beautiful work, entitled "Portraits of the Game and Wild Animals of Southern Africa," the annexed illustration of the brindled species is given, furnishes the following proof of their speed, and of their resemblance to a lion when seen at a great distance. "Whilst crossing the boundless plains of the Vaal river, we had an opportunity of remarking the very similar appearance of the two animals, in twice witnessing the animating but abortive pursuit of a herd of Gnoos by an enormous lion, rendered perfectly furious by the qualms of hunger, and still more desperately frantic at the disappointment entailed by the slippery heels of his intended victims, who, on both occasions, left their grim pursuer far behind, puffing and blowing, to grumble over the loss of the morning repast which he had vainly promised himself." The same eloquent writer, thorough sportsman, and competent naturalist, says—"These ungainly beasts are nevertheless shot from horseback without much difficulty, and can scarcely be pronounced formidable except in external appearance. The eyes are lowering and expressive of great ferocity; the solid casque of the horn, by which their beetling brows are overshadowed, greatly heightening their aspect of suspicion and vindictiveness. Like other animals possessing dispositions far more gentle and tractable, the Gnoo is naturally prone to charge in self-defence when wounded or forced into a corner; but, after fracturing its leg, I have repeatedly driven a reluctant individual up to the waggons, either to escape the trouble of carrying his sirloin, or because I had expended the last bullet in my pouch. In the wild districts bordering on the colony, where a succession of level plains are traversed by low ranges of bare stony hills, prancing troops, consisting of from fifteen to thirty Gnoos of various sizes, are to be seen engaged in the most wanton frolics, and may easily be hemmed into a valley and compelled to run the gauntlet." And further on he adds:—"The curious and inquisitive disposition of the Gnoo, often induces the herd to discontinue their giddy gambols, and slowly to approach the passing caravan with an air of laughable defiance, formed in a compact square, gazing, menacing, stamping with their slender fore-feet, and at length halting within rifle range to scrutinize the bold intruders upon their lone and hereditary pastures." Such is Captain Harris' account of the whimsical character of this singular antelope, and it is fully borne out by the less animated descriptions of other travellers. The female Gnoo usually produces a solitary calf at a single birth, which at first exhibits a whitish cream-coloured fur, subsequently becoming reddish-grey. The flesh of the adult is coarse, but that of the calf is considered excellent. The tail is used for making chowries, whilst the hide is brayed and converted into riems or thongs; in this state it is chiefly employed as harness, being also applied to other economic uses as a substitute for rope or twine.

Fig. 58



The Brindled Gnoo (Catoblepas Gorgon).

THE BRINDLED GNOO (*Catoblepas Gorgon*), KOKOON, or GORGON, is readily distinguished from the common species by its arched face, laterally directed horns, deep bluish-black hide striped with obscure vertical bands, absence of any tufts of hair between the fore-legs, and immensely thick, elevated and powerful shoulders (fig. 58). The body measures nine feet in length, including the tail and head; the latter alone being twenty-three inches from the tip of the muzzle to the occipital crest. The Brindled Gnoo inhabits the interior plains of Southern Africa to the north of Orange river, its manners being similar to those of its congeners. According to some authorities the name *Kokoon* ought to be applied to the common species; but we prefer the authority of Captain Harris, who remarks that it is thus named by the Bechuanas, while the Dutch colonists call it the *Bastaard*, and the Hottentot tribes designate it the *Baas* or *Kaop*. He gives also the following graphic description of its manners:—"When excited by the appearance of any suspicious object, or aroused by any unusual noise, the Kokoon is wont to appear much more grim and ferocious than it actually proves; not unfrequently approaching with an air of defiance, as if resolved to do battle with the hunter, but decamping upon the very first exhibition of hostility on his part. On being pursued, the herd bring their aquiline noses low between their knees, and flourishing their streaming black tails, tear away in long regular files at a furious gallop; wheeling curiously about at the distance of two or three hundred yards, advancing boldly towards the danger, tossing their shaggy heads in a threatening manner, presently making a sudden stop, presenting an impenetrable front of horns, and staring wildly at the object of their mistrust. The slightest demonstration, however, is sufficient to put the whole squadron to flight, when they make a somewhat shorter excursion, again wheel in a circle, show a more menacing and imposing front than before, and most probably take up their position within sure rifle range. When engaged in grazing, they have an extremely dull and clumsy appearance, and at a little distance might often be mistaken for wild buffaloes; but their usual manner is sportive, at one moment standing to gaze at nothing, and at the next scampering over the plain without any apparent object in view, making various grotesque curves and plunges, with their preposterous bonassus-looking heads laid between the fore-legs." The flesh of the Kokoon resembles that of beef, and is much sought after by the natives. The hide is dressed with the mane and beard attached, and when carefully prepared is converted into useful and ornamental cloaks, shawls, and tippets.

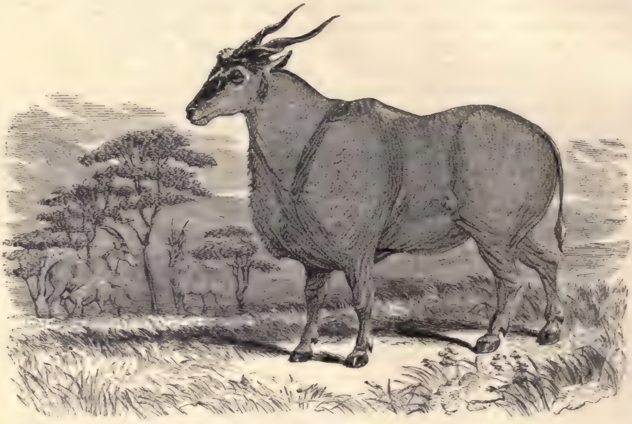
THE NYL-GHAU (*Portax picta*)—Plate 20, fig. 67—is a native of India. It is as large as a stag, the summit of the shoulders standing more than four feet from the ground. The fur exhibits a tawny, ferruginous colour generally, being in the male of a uniform bluish-grey at the upper parts. The head is furnished with a pair of short horns, about seven inches in length, which are slightly recurved forwards; they do not exist in the female. The muzzle is remarkably attenuated; the ears are rounded, and the lachrymal sinuses rather large. The neck is broad and compressed laterally; and at the under part, near the middle line, it is furnished with a conspicuous tuft of hair. Immediately above this beard-like development there is a whitish spot; two similar patches being also seen on either cheek, below and in front of the eye. Besides these, the pasterns are marked with white spots forming more or less distinct bands round the ankle-joints. The mane is pretty strongly developed, especially over the region of the shoulders, where it forms a thickish tuft. The tail is long and bushy at the tip. According to Mr. Ogilby, the Nyl-ghau dwells principally in dense forests, "whence it occasionally makes excursions very early in the morning, or during the night, to feed upon the corn-fields of the natives which happen to be situated in the vicinity of the jungle. It is a vicious animal, of very uncertain temper, and as it is both powerful and resolute, and frequently turns upon its pursuers, it is seldom made an object of chase, except by the native princes, who employ elephants for this purpose, or inclose the game in nets." It is likewise added, that "even in confinement, and when domesticated from birth, the violent and changeable temper of the Nyl-ghau cannot be trusted. Previous to making an attack, it drops upon the fore-knees, advancing in this position till within a proper distance; then darting suddenly forwards with the velocity of an arrow, and with a force which no ordinary animal can withstand." The female commonly produces two young at a birth, her period of gestation extending over a period of eight months.

THE BOSCH-BOC (*Tragelaphus sylvatica*) is an inhabitant of Cape Colony and Caffraria, dwelling more particularly in forests near the sea-coast. The body of a full-grown male stands two feet eight inches high at the shoulder, and measures rather more than five feet in length. The fur exhibits a bright-chestnut colour generally, being darker superiorly, but marked along the spine by a narrow white streak; white spots also exist on the cheek, as well as on the flanks and fetlocks. The forehead has a deep sienna-brown colour, and the neck is encircled by a collar-like band of a still darker hue. The horns are about a foot long, thick below, and gradually attenuated towards the rather blunt extremities; their position is erect, and they are marked by spirally directed ridges in front and behind, which disappear after traversing the first two-thirds of their length. The ears are large and rounded, the limbs stoutish, the tail of moderate extent, and the muzzle naked. There are no lachrymary openings. The females are hornless, and furnished with four mammæ. Respecting the habits of the Bosch-boc, Mr. Ogilby states that it never quits its forest haunts except during bright moonlight nights, "when it comes out to graze on the border of the forest, or to make incursions into the neighbouring gardens and corn-fields. Its voice resembles the barking of a dog, and its deceitful tone sometimes leads the benighted traveller into the most remote and lonely depths of the forest, in the vain search after some human habitation, which he is all the time leaving behind him. It is a slow runner, and easily caught when surprised; but it keeps close to the woods, through which it penetrates with great ease, running with the horns couched backwards along the sides of the neck to prevent them from impeding its course by striking against the branches, and having the neck and throat frequently denuded by rubbing against the underwood, as it forces its passage through the thick covers." The Bosch-bocs are monogamous, or solitary, the male and female being usually found together, or accompanied only by one or two offspring.

THE KOODOO (*Strepsiceros Kudu*) is also an inhabitant of the wilds of Caffraria and Southern Africa, generally frequenting also the borders of streams, and not refusing to take to the water when occasion may require. It is a very large and attractive species, measuring upwards of nine feet in extreme length, and standing more than five feet high at the shoulders. The horns are massive and beautifully curved into two wide-spreading spiral circles; they are upwards of three feet in length, of a brown colour, having their tips directed outwards and upwards. The muzzle is broad, the ears large and pointed at the ends, the forehead black, the shoulders much elevated, and there are no suborbital sinuses. The fur has a buff-grey colour generally, the limbs being reddish below the knees, the rump white, the tail, which is two feet in length and tapering, being rufous and whitish at the margins; three white spots exist on the cheek, and a pale band passes along the central line of the back, giving off, as it were, at right angles, five or six transversely-disposed whitish bands, directed downwards on either side towards the belly. These markings are not so conspicuous in the female, which is also of slighter build, destitute of horns, and furnished with four mammæ. The Koodoos are gregarious, and, though still found within the colony, are comparatively scarce. They are deservedly admired by travellers who have seen them in the wild state. "Of all the varied and beauteous forms of animal life to be found in the boundless woods and plains of tropical South Africa, the Koodoo is unquestionably the most distinguished for elegance and gracefulness, united with strength." So writes Mr. Andersson, who considers it a perfect picture, and "one of the grandest-looking antelopes in the world." The same ardent sportsman gives us an account of a curious method adopted by the natives for its capture:—"The Bushmen have a way of their own of hunting the Koodoo, viz., by running it down, not by speed of foot, but by gradually exhausting it! When a hunt of this kind is decided on, a number of these people assemble, armed with assegais, &c. Having started the animal, one of the party takes up its "spoor" at a quick pace, the rest following more leisurely. On feeling fatigued the leading man drops behind his comrades, and the next in order takes up the pursuit, and so on, until they secure the prize. Sometimes this is effected in the course of a few hours; but it happens also that the chase lasts for a whole day, or even longer. All depends on the ground. If stony or rocky, the men have an immense advantage over the animal, which, under such circumstances, soon becomes foot-sore, lies down repeatedly, and after a while is found unable to rise, when it is quickly despatched. The women and children carry water on these occasions for the hunters, so that, should the animal prove very enduring, his pursuers may not be necessitated to give up the chase for want of that indispensable necessary." The flesh of the Koodoo is highly esteemed, and the hide is converted into various articles of clothing, harness, &c.

THE ELAND (*Boselaphus oreas*) is a magnificent animal, the largest of the antelopes, and on many accounts deserving of an extended notice. It is also known by the names of the Cape Elk, Ganna, and *Impoofoo*—the latter term being employed by the Bechuanas and Matabili. The importance of this ruminant will be at once appreciated when it is mentioned, that not only is its flesh of the most palatable and nutritious character, but experiments have recently established the fact that it will readily breed in this country. When it is added, moreover, that several are now thriving in the parks of English noblemen, and that a single individual weighs from fifteen hundred to two thousand pounds, it will be easily understood that the day cannot be far distant when the Eland shall become permanently domesticated in this country, and supply wholesome food, at least to the table of the wealthy. Not long ago an Eland, bred and fattened in England, was slaughtered for the express purpose of testing its epicurean qualities, the result of which was that Royalty, both on this and the other side of the channel, partook of the venison, and pronounced it excellent. Professor Owen extolled its qualities in the columns of the *Times*, whilst many other distinguished fellows of the Zoological Society testified to the accuracy of his judgment. In short, every body pronounced a favourable opinion, in terms very similar to those of the gifted author of the "Game and Wild Animals of Southern Africa," who amusingly says:—"Both in grain and colour it resembles beef, but is far better tasted and more delicate, possessing a pure game flavour, and exhibiting the most tempting-looking layers of fat and lean; the surprising quantity of the former ingredient with which it is interlarded, exceeding that of any other game quadruped with which I am acquainted. The venison fairly melts in the mouth; and as for the brisket, that is absolutely a cut for a monarch! With what satisfaction would not King Jamie of hunting memory, have drawn his good blade adown the breast of a plump Eland, to be rewarded with five full inches of 'prime white fat on that ilk,' instead of three, as on the occasion in Greenwich Park, when Nigel assisted his sporting Majesty in the sylvan ceremony? The vast quantity of tallow yielded by the fat bulls, furnished us with constant material for manufacturing 'dips' in a candle mould with which we were provided; and during the greater part of our journey it was to the flesh of this goodly beast that we principally looked for our daily rations, both on account of its vast superiority over every other wild flesh, and from the circumstance of its being obtainable in larger quantities with comparatively less labour." Here we must pause to mention the principal characters by which this gigantic antelope is easily distinguished (fig. 59). An adult male stands fully six feet high at the shoulder, or even more; the length being in some cases upwards of nine feet from the nose to the root of the tail. The horns are nearly straight, massive, conical, furnished with a strongly-developed spiral ridge, which gradually disappears at the upper third, where the ends become attenuated and sharply pointed. In the female the horns are longer, slighter, and less markedly furrowed. The forehead of the male is clothed with a thick bundle of stiff, wiry, brownish hairs; the tuft being bordered on either side by a band of yellow-orange colour. The ears are comparatively small and the muzzle broad, the neck thick, the dewlap very prominent and fringed with long brown hairs, the legs rather short, the shoulders and hind quarters enormously developed, the fur short and of a rufous-dun or ashy-grey colour generally, the tail being about twenty-six inches long and tufted at the extremity. The female exhibits a bead-like tuft of hair on the under part of the neck, has a more ferruginous colour, and is furnished with four teats. Respecting the habits of this interesting animal, it is well known to frequent only the more open plains of the interior; "rejoicing especially," says Captain Harris, "in low belts of shaded hillocks, and in the isolated groves of *Acacia capensis*, which, like islands in the ocean, are scattered over many of the stony and gravelly plains of the interior; large herds of them are also to be seen grazing like droves of oxen on the more verdant meadows, through which some silver rivulet winds in rainbow brightness betwixt fringes of sighing bulrushes. Fat and lethargic groups may be seen scattered up and down the gentle acclivities, some grazing on the hillside, and others lazily basking in the morning sunbeam. Advancing, they appear to move like a regiment of cavalry in single files, the goodliest bulls leading the van; whereas, during a retreat, these it is that uniformly bring up the rear." At one time Elands were abundant in the immediate neighbourhood of Cape Town, but now very few are found within the borders of the colony. Considering the facilities which exist for their destruction, every effort should be made to follow up the experiments of domestication so successfully commenced by the Zoological Society, and steps should be duly taken to secure more specimens from the colony, ere they are driven far up into the interior, or altogether exterminated. Finally, we may remark that Dr. Livingstone discovered to the north of Sesheke a beautiful striped variety of Eland, distinguished by vertical streaks on the back, and by black patches on the outer side of the fore-arm.

Fig. 59.



The Eland (Boselaphus oreas).

THE HARTE-BEEST (*Acronotus Caama*), or CAAMA, is also called *Intoosel* by the Matabili. It is a large species, with a long head and much elevated shoulders. The horns are of moderate length, approximating closely at the base, diverging at first, and again converging towards the tips. The back, the nose, and the hind and fore legs are marked with dark streaks; the chin being also black. The general colour of the fur is greyish-brown, with a deep red cast. The tail is hairy and reaches down to the hocks. The Harte-beest occupies the plains of the interior of Southern Africa in immense herds, and is one of the most common species. Its flesh, though inferior to that of the eland, is nevertheless fine-grained and highly esteemed. The female is provided with two mammæ, and produces only one calf at a birth.

THE SASSABE (*Acronotus lunata*), or BASTARD HARTE-BEEST, is likewise a native of Southern Africa, occurring in small herds in the district inhabited by the Bechuanas. A full-grown example stands about four and a half feet high at the shoulder, and is furnished with horns nearly twelve inches in length. The body is stoutish, the neck short, the limbs slender, the withers elevated, the lachrymal sinus inconspicuous, the ears being eight or nine inches long. The general colour of the fur is rufous-grey; the upper parts and legs have a deep brown tint, the forehead being marked by a dark longitudinal band. The Sassabe is naturally tame, but is much hunted by the natives. The female is comparatively small, and furnished with two mammæ.

THE BUBALE (*Alcephalus bubalus*) is widely distributed over the entire regions of Northern Africa, being especially abundant in Barbary. It is gregarious in its habits, and naturally docile in disposition. By the Arab natives it is termed the wild ox, or *Bekker-el-Wash.* It is a large species, and is readily distinguished by its remarkably compressed and straight forehead. The horns are of moderate length, lyrate, stout at the base, and strongly annulated throughout.

THE COMMON ANTELOPE (*Antilope cervicapra*), or SASIN—Plate 19, fig. 65—is a native of Persia, India, and the southern parts of Asia generally, where it dwells on rocky hills and open plains. It stands something less than three feet high at the shoulder, and is furnished with slim legs, a short tail, and a pair of large horns, which are beautifully annulated and spirally curved. The full-grown male is almost black above; the inside of the legs, under parts of the neck and belly, and the rump remaining white. The Sasin is altogether an elegant species, and remarkably swift of foot, leaping, it is said, as much as thirteen feet in height, and clearing a space of twelve yards at a single bound! The flesh is insipid.

THE PALLAH (*Antilope melampus*), or Betjuan, is a native of South Africa. It is a fine species, standing upwards of three feet high at the shoulders. The horns are twenty inches in length, lyrate, and coarsely annulated. The general colour is rufous, being much darker above than below, whilst the belly is quite white. The tail is about a foot long, white at the extremity, and marked by a dark-brown streak down the middle. The Pallah is gregarious in its habits; only six or eight individuals constituting a herd. The females are hornless, and provided with two teats. The flesh is coarse, but palatable.

THE MADOQUA (*Antilope Saltiana*) is a remarkably small and slim-built antelope inhabiting the mountainous districts of Abyssinia. The summit of the shoulder is only fourteen inches above the level of the ground; but it stands rather higher on the hind quarters. The horns are correspondingly thin, and about three inches in length, whilst the tail is only rudimentary, measuring scarcely more than one inch and a half from root to tip. The females are hornless.

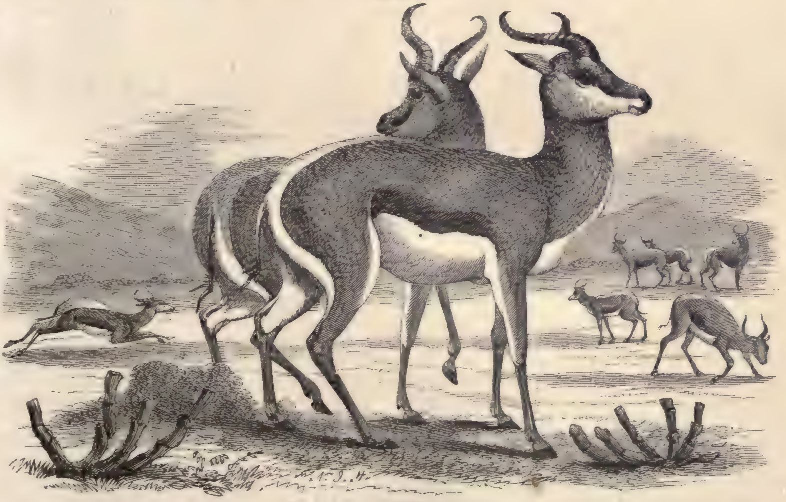
THE GUEVI (*Cephalophus pygmæus*)—Plate 19, fig. 64—is even smaller than the species above described, and has been variously designated the Pigmy antelope, Kleene, Blauw-boc, and Monmetzi. It is a native of South Africa, dwelling either singly or in pairs amongst dense woods and thickets near the sea-coast. The head is long and pointed, with a wide muzzle, short round ears, and diminutive horns; the latter being less than two inches long, black, conical, and strongly annulated. The tail is about the same length, dark above and white below. The fur exhibits a dull-brownish, buff, or mouse colour, generally; being lighter underneath. The females are hornless.

THE MOHR (*Antilope Mohr*) is an inhabitant of Western Africa, and stands about two and a half feet in height at the shoulder. The horns are of moderate size, thick, and strongly annulated at the lower two-thirds of their extent, the tips being rather sharp, and bent forwards. The fur exhibits a deep brownish-red colour generally, but is white underneath and on the back part of the rump. The Mohr is highly valued by the Arabs on account of the bezoar stones or concretions found in its intestines.

THE SAIGA (*Antilope colus*), or Colus, is an inhabitant of eastern Europe from Poland to the Caucasus, being also found in Northern Persia and Siberia. It is of moderate size, and rather bulky in appearance. It is gregarious in its habits, many thousands of them herding together, and migrating southwards during the cold season. They are much hunted and valued for the sake of their horns, which are light-coloured, semitransparent, and slightly twisted on their axis; the skins of the young are likewise highly esteemed, and employed in the manufacture of gloves.

THE CHIRU (*Antilope Hodgsoni*) is another gregarious species inhabiting the open plains of Thibet. It is a fine animal, measuring three feet in height at the shoulder, and furnished with annulated horns more than two feet in length. The fur displays a bluish-grey colour generally, overcast with a rufous tint. The tail measures about eight inches from root to tip. The Chiru is shy, bold, swift, and, like other species in which bezoar stones are found, is very partial to saline matters, which it licks greedily.

Fig. 60.



The Spring-boc (Gazelle Euchore).

THF SPRING-BOC (*Gazella Euchore*) is a beautiful little creature, everywhere scattered over the plains of Southern Africa in countless herds (fig. 60). The horns are black, lyrately disposed, provided with about twenty prominent annulations, and curved inwards at the tip. The fur exhibits a bright rufous-dun colour, the flanks being marked on either side by a broad, rich, and deep chestnut-coloured band. The belly and insides of the legs are quite white. One of the most curious features in this species consists in the presence of several folds of integument over the rump and loins, which, when the animal is excited, are unfolded, and by the snow-white aspect of the fur at this point, present a very singular appearance. The tail is about eight inches in length, and tufted with black hairs.

THE GAZELLE (*Gazella Dorcas*) is a native of North-eastern Africa, and from its extreme elegance of form, coupled with large, full, lustrous eyes, has deservedly acquired distinction. The Gazelle or Corinne, as the female is sometimes called, stands less than two feet high at the withers, and is furnished with a pair of strongly annulated horns about ten inches in length. The ears are conspicuous and sharply pointed. The fur is more or less fawn-coloured or fulvous, but varies according to age. The habits of the Gazelle are gregarious. Considering their slender build, they are remarkably courageous, and will unite to defend themselves against the strongest Carnivora, although they usually fall victims to these overpowering enemies.

THE STEEN-BOC (*Antilope tragulus*) was formerly a very common species, inhabiting the mountainous plains and open valleys of Southern Africa; but now it is becoming comparatively rare in the colony. It stands about twenty-two inches high at the shoulder, and is furnished with round slender horns, about four inches long. The ears are large, but the tail is only rudimentary, and scarcely an inch in length. The fur has a rich rufous colour. The habits of the Steen-boc are monogamous, or solitary; the females being hornless, and provided with four mammæ.

THE GRYS-BOC (*Antilope melănotis*) pretty closely resembles the steen-boc, both as respects its solitary habits and general appearance. The horns are about three and a half inches long, the general colour of the fur being of a deep chocolate red. The ears are broad and rounded. The Grys-boc is found more particularly among the wooded districts bordering the sea-coast. The females are hornless, and provided with only two mammæ.

THE DUIKER-BOC (*Antilope Grimmia*), or IMPOON of the Matabili, is also a Cape species frequenting those districts near the sea-coast, and possessed of monogamous habits. It is about two feet in height, the horns being four inches long, and marked by a longitudinal ridge in front, which traverses four or five rings at the middle. The fur is yellowish-brown; but in winter it assumes a cinereous olive tint; the forehead being clothed with a patch of long fulvous-coloured hair. The tail is short, black, and tipped with white. The female has four mammæ; her horns being very short, and concealed beneath the hair.

THE BLESS-BOC (*Antilope albifrons*), or WHITE-FACED ANTELOPE, is a native of Southern Africa, inhabiting the plains bordering on the Vaal river, and herding in immense flocks. A full-grown buck stands three feet and a half in height, and carries a pair of diverging annulated horns, measuring from twelve to fifteen inches in length. The fur has a deep chocolate colour in front, gradually passing into a hoary bluish-white on the back and shoulders, the belly being quite white. The tail is long, reaching to the hocks. The female is similar, but of lighter build.

THE RHEE-BOC (*Antilope Capreolus*), is a gracefully formed Cape species, occurring in small herds amongst the hills and rocks in the neighbourhood of water pools and dried-up rivers. It stands about two feet four inches high, and is furnished with straight, slender, vertically-pointed horns, nine inches in length. The fur has a light rufous-grey colour, being white underneath the belly; its texture is woolly. The females have four mammæ, and are hornless.

THE REIT-BOC (*Antilope eleotragus*), or INGHALLA, possesses similar habits, and is a comparatively rare species, occurring only in the more northern parts of Cape colony, and higher up in the interior. It is larger than the foregoing, standing three feet high; the horns measure about a foot in length, and are annulated. The ears are long and pointed; the tail being also conspicuously developed. The fur exhibits a dull ash-grey colour, having a rufous tinge above, while it is lighter underneath. The females have four mammæ, are smaller than the bucks, and hornless. The reit-boc is gregarious in small families.

THE WATER-BOC (*Antilope ellipsiprimna*), or PHITOMOK of the Matabili, stands upwards of four feet at the shoulders. The horns are strongly annulated, upright, diverging, of a whitish-green colour, and upwards of thirty inches in length, the last six inches being smooth and destitute of rings. The fur has a greyish-brown tint generally; a white patch occurs on the throat, and a similar streak before each eye. The ears are full and rounded; the tail being brown and tufted, and scarcely reaching to the hocks. There are no suborbital sinuses. The females are hornless, and have two mammæ. The Phitomoks are gregarious, inhabiting the banks of the rivers of Southern Africa, especially those of the Limpopo and Mariqua.

THE GEMS-BOC (*Antilope Oryx*), or KOOKAAM, of the Matabili, is found chiefly in the Karroo, or in the open plains of Namaqualand in Southern Africa. It is a strong, bulky, and courageous species, and is armed with a pair of formidable horns, which are upwards of three feet in length, almost straight, divergent, annulated below, horizontally disposed, and tapering to a point; between them a black stripe passes down the forehead, which is crossed by a similar band above the muzzle. The ears are white, with black margins. The fur has a rusty iron-grey colour generally; it supports a mane, the hairs of which are reversed in direction; the under parts of the belly and thorax, as well as the legs, being white. The tail is bushy, black, and three feet long. The females have two mammæ, whilst their horns are even longer than those of the buck.

THE BLAUW-BOC (*Antilope leucophæa*).—Not a little confusion has arisen in regard to this species, the name here given having been applied to the little slate-coloured antelope. The Blauw-boc is, with its varieties, also known as the Bastard Gems-boc, Roan Antelope, *Etak* of the Matabili, and Takhaitze; the latter constituting a well-marked variety, known by its increased size, large beard, and fine flowing mane. It is also distinguished for its fierceness. The Etak, properly so called, stands about five feet high at the shoulder, and is furnished with scimitar-shaped horns two feet in length; they are strongly curved backwards, and marked with about thirty conspicuous annulations. The face is black, with white streaks in front and behind the eyes; the muzzle and under parts being also white. The ears are pointed, and fourteen inches long. The fur exhibits a roan or reddish-white colour generally. The females are hornless.

THE LECHEE (*Antilope Lechée*) is a large animal, inhabiting South Africa, on the banks of the river Louga. In its habits and character, it very closely resembles the Water-boc. The horns are elongated, annulated, and curve forwards at the tip. The fur has a light brown colour generally, the limbs being much darker. In the male the mane is slightly developed; the tail being tufted and black at the extremity. Both Dr. Livingstone and Mr. Andersson have given interesting particulars of this species. The former says, "It is never found a mile from water; islets in marshes and rivers are its favourite haunts, and it is quite unknown except in the central humid basin of Africa. Having a good deal of curiosity, it presents a noble appearance as it stands gazing with head erect at the approaching stranger. When it resolves to decamp it lowers its head, and lays its horns down to a level with the withers; it then begins with a waddling trot, which ends in its galloping and springing over bushes like the pallahs. It invariably runs to the water, and crosses it by a succession of bounds, each of which appears to be from the bottom." Mr. Andersson informs us that "great numbers are annually destroyed by the Bayeye, who convert their hides into a kind of rug for sleeping on, carosses, and other articles of wearing apparel."

THE NAKONG (*Antilope Anderssonii*).—Believing this antelope to be new to science, we do not hesitate to recognize it under the above specific title. Dr. Gray thinks it may be referred to Ogilby's broad-horned antelope, but the characters, in so far as they are given by Mr. Andersson, lead us to a different conclusion. The fur displays a subdued brown colour, which is darker on the back and on the fore-part of the head and legs; having an ashy tint underneath the belly. The hair is long, and coarse in texture. The horns are black, closely resembling those of the koodoo. Its habits are similar to those of the last-described species. "By means of its peculiarly long hoofs, which are black—not unfrequently attaining a length of six to seven inches—it is able to traverse with facility the reedy bogs and quagmires with which the lake country abounds." Mr. Andersson adds that the natives frequently, at particular seasons, capture the Nakong by means of pitfalls.

THE LEUCORYX (*Antilope Leucoryx*), WHITE ANTELOPE, or ORYX—Plate 20, fig. 60—is a native of Eastern Africa. The fur has a milky-white colour generally, the throat and neck being rufous-brown; dark bands also occur on the forehead and cheeks, two of them passing vertically downwards from the inner corner of the eye. The mane is short and reversed; the tail being lengthy and tufted at the tip. The horns are very attenuated, annulated at the lower half, and slope obliquely backwards with a very slight curvature. The Leucoryx is gregarious in its habits, and feeds freely on acacia shrubs.

THE ADDAX (*Antilope Addax*) is a native of Northern and Central Africa, and is a bulky, thick-set animal, standing upwards of three feet at the shoulder. The horns are long, narrow, spirally twisted, ringed to within five inches of the tips, sharp at the points, and measuring about thirty-six inches from base to apex. The forehead is clothed with a patch of black curly hair; the mane is well developed, the fur having a greyish-white tint generally; but the head and neck are rufous-brown. The Addax has monogamous habits.

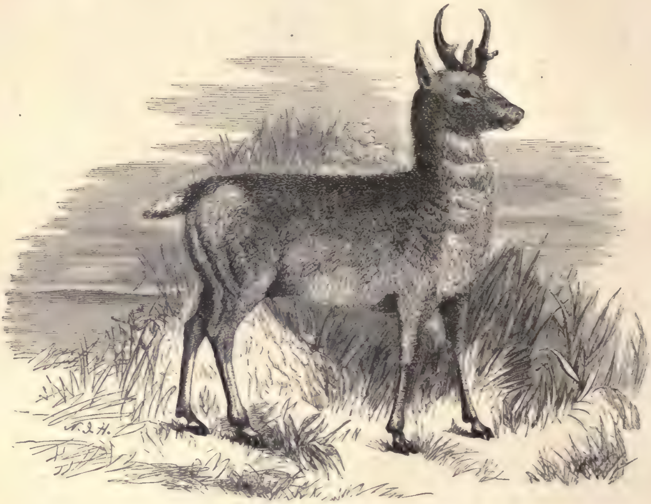
THE CHOUSINGHA (*Antilope quadricornis*) or FOUR-HORNED ANTELOPE, is an inhabitant of the northern and well-wooded districts of India, being found especially in the districts ot Bahar and Orissa. It is a comparatively small species, standing about twenty inches at the shoulders. The horns are smooth, black, conical, and sharply pointed; the posterior pair being three inches in length, while the anterior are scarcely a third of that measurement. The fur has a reddish colour generally, being whitish underneath. The females are hornless, and of a paler hue; they usually produce two young at a birth. The Chousingha is excessively wild; it is also monogamous.

THE CAMBING-OUTAN (*Antilope Sumatrensis*) is an inhabitant of the hilly forests of Sumatra, and in its habits approaches the goats and chamois. The horns are about six inches in length, slightly curved backwards, broad below, and sharp at the apex. The body is stoutish, and clothed with a long deep brown-coloured fur, approaching to black, except on the back of the head, neck, and shoulders, and inside of the ears, where it is quite white; the mane being well developed and the tail moderately long. The habits of the Cambing-outan are wild and restless.

THE CHAMOIS (*Antilope Rupicapra*) is an inhabitant of the alpine slopes of Western Europe, and, like the preceding species, is closely allied to the ægoscervine family. It is clothed with a deep-brown woolly fur, the head being of a paler colour, and banded on either side by a dark streak, which passes from the angle of the mouth to the eye and base of the ear, enveloping both. The horns are from six to eight inches long, running nearly parallel to each other, and curving backwards at the tip. The tail is short and black. The habits of the Chamois are wild and impetuous, like the torrents which it overstrides in rapid flight. It feeds on young shrubs and various alpine herbs.

THE PRONG-HORN (*Antilope furcifer*) or CABRIT, is an interesting species, as it presents a sort of transitional form between the antilopine and cervine genera; and it is for this reason that we have reserved its consideration until compelled to draw our descriptions of the members of the present family to a close. The Prong-horn is a native of the western borders of North America generally, being more particularly abundant on the borders of the Saskatchewan and Columbia rivers. It is a stoutish animal, upwards of three feet high at the shoulder, and at once recognized by its peculiar horns, which arise from the forehead immediately above the eyes, giving off a sort of brow antler about half way up, and curving suddenly backwards and inwards at the tip (fig. 61). Below the prong the horns are rough, like those of the deer; but above they are black and smooth. The fur has a fawn colour generally; being whitish on the throat, chest, belly, and rump. The Prong-horn is gregarious in its habits, frequenting open plains and hilly grounds. The flesh is coarse and unsavoury. The horns of the female are rudimentary.

Fig. 61.



The Prong-horn or Cabrit (Antilope furcifer).

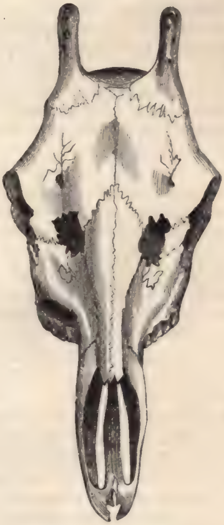
According to Sir John Richardson, "the most northerly range of the Prong-horn antelope is latitude 53°, on the banks of the north branch of the Saskatchewan. Some of them remain the whole year on the south branch of that river; but they are merely summer visitors to the north branch. They come every year to the neighbourhood of Carlton House when the snow has mostly gone. Soon after their arrival the females drop their young, and they retire southwards again in the autumn as soon as the snow begins to fall. Almost every year a small herd linger on a piece of rising ground not far from Carlton House, until the snow has become too deep on the plains to permit them to travel over them. Few or none of that herd, however, survive until the spring, as they are persecuted by the wolves during the whole winter. They are found in the summer season in the fifty-third parallel of latitude, from longitude 106° to the foot of the Rocky Mountains. According to Lewis and Clark, they also abound on the plains of the Columbia, to the west of the mountains, where they form the chief game of the Shoshonees." Our authority also adds, that "the Prong-horn appears on the banks of the Saskatchewan, sometimes a solitary animal, sometimes assembled in herds of ten or twelve. Its sight and sense of smell are acute, and its speed is greater than that of any other inhabitant of the plains, although I have been informed by Mr. Prudens, that when there is a little snow on the ground, it may with some little management be run down by a high-bred horse. The Indian hunters have no difficulty in bringing an antelope within gun-shot by various stratagems, such as lying down on their backs and kicking their heels in the air, holding up a white rag or clothing themselves in a white shirt, and showing themselves only at intervals. By these and similar manœuvres the curiosity of a herd of antelopes is so much roused, that they wheel round the object of their attention, and at length approach near enough to enable the hunter to make sure of his mark. From this disposition of the Prong-horned antelopes, they are more easily killed than any of the deer of the district which they inhabit."

Had space allowed, we should have supplied short notices of several other antelopes, including the Kob, Sing-sing, Nagor, Haar, &c.

FAMILY IV.—CAMELOPARDIDÆ.

Although represented only by a single genus, the characters of this family are sufficiently distinctive and osculant between the antilopine, cervine, and cameline species, to warrant the propriety of their being separately treated. We have already taken occasion to mention one unique structure in connection with the intestinal canal; but there are others scarcely less characteristic, being also more obvious. Firstly, we notice the horns, which are solid, persistent, and completely invested with a hairy integument. A question has been raised as to the existence of a central or third horn. If our space permitted, we should be able to remove all doubt upon this point, having carefully compared a number of crania together, and satisfied ourselves as to the substantially correct views originally enunciated by Ruppel in "Reise in Nordlichen Afrika." Another peculiarity in the cranium arises out of a remarkable extension of the frontal, ethmoidal, and sphenoidal cells (fig. 62). These form a series of large intercommunicating air cavities on the top of the head, reaching from the middle of the face to the occiput. Finally, the special elongation of the tongue, the prominent orbits, the powerful ligamentum nuchæ, the long muzzle, the usual though not invariable absence of a gall-bladder, and some other minor peculiarities, satisfactorily demonstrate the legitimacy of the grounds on which the Giraffe may be considered as the representative of a distinct family.

Fig. 62.



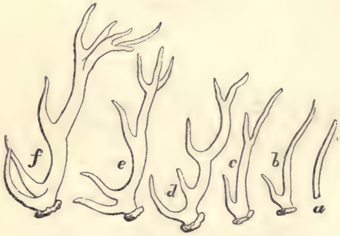
Front view of the Skull of the Giraffe.

THE GIRAFFE (*Camelopardalis Giraffa*), or CAMELOPARD—Plate 22, fig. 73—is a native of Abyssinia and the plains of Central Africa generally. It is a singularly beautiful and attractive creature, and is the tallest of all animals living on this planet—the head of a full-grown example occasionally reaching as much as eighteen feet, and the shoulders twelve feet, from the ground. The fur is short, whitish underneath, and marked throughout by angular fulvous red spots, which have a dark rusty tinge in the centre. The upper lip is extensile and undivided, the ears large, the eyes expressive, the body short, the tail being nearly three feet in length and tufted with black hair. The Giraffe is gregarious in small troops. It is naturally gentle, timid, and docile, and, as Captain Harris observes, has no other means of protection than that afforded by the swing of the head and neck, and by the kicking of its heels, seldom employing the latter even when hemmed into a corner. The speed of Giraffes is considerable, and often secures the safety of these harmless animals; their movements during flight being characteristic and peculiar. The limbs of either side do not, as is well known, move alternately, as in the trot of a horse; but the fore and hind legs of one side are advanced almost at the same instant, so as to produce a swinging action of the body. Their tails are also partly raised and curled during flight, the tufted ends being restlessly switched to and fro. The Giraffe feeds upon mimosa twigs and blossoms. In its selection it would appear to be guided rather by sight than by taste or smell; for Professor Owen mentions that one of the fine specimens preserved in the Zoological Society's Gardens, Regent's Park, observing a lady's bonnet to present a very flowery aspect, suddenly, yet gently and politely, applied its extensile tongue to the gaudy trash, and without further ceremony consigned the tokens of her vanity to the macerating influences of its capacious paunch! In like manner the conceit of a peacock has been observed to subside under the magic touch of this lingual wand; for the bird having invaded the paddock, one of the Giraffes took occasion, when the uplifted tail had duly displayed this poor bird's pride, to gather a bunch of the bright-eyed feathers on his tongue, and swiftly raising the astonished intruder high into the air, gave him a vigorous shake, permitting him again to reach the paddock ground, from which he hastily retreated to hide his diminished tail and head!

FAMILY V.—CERVIDÆ.

The true stags and deer are at once distinguished by the presence of deciduous branching horns in the male; the females being in nearly all cases hornless. These organs vary much in character, being rounded in some species and flattened in others. They are in reality outgrowths from the cranium, and, being developed periodically, have an important physiological significance. Without detailing the anatomical and morphological changes which these singular organs annually undergo in the more typical forms, we deem it sufficient to indicate the peculiar phenomena which are contemporaneously developed during the periodical renewal of the antlers; and we do so in language we have elsewhere employed. A strong determination of blood to the head takes place at the spring of the year, and the vessels surrounding the frontal eminences enlarge. This increased vascular action results in the secretion of a fibro-cartilaginous matrix, manifesting itself externally by a budding, commencing at the summit of the core, at the spot where the horns of the previous season had separated. In the early condition the horn is soft and yielding, and it is protected only by a highly vascular periosteum and delicate integument, the cuticular portion of the latter being represented by numerous fine hairs closely arranged. From this circumstance the skin is here termed the "velvet." As development goes on, a progressive consolidation is effected, the ossification proceeds from the centre to the circumference, and a medullary cavity is ultimately produced. While this is taking place, a corresponding change is observed at the surface. The periosteal veins acquire an enormous size, and by their presence occasion the formation of grooves on the subjacent bone. At the same time osseous tubercles of ivory hardness appear at the base of the stem; these coalesce by degrees, and inclose within their folds the great superficial vascular trunks, which are thus rendered impervious. The supply of nutriment being thus cut off, the first stage of exuviation is accomplished by the consequent shrivelling up and decay of the periosteal and integumentary envelopes. The full growth of the horns is now consummated, and the animals being aware ot their strength, endeavour to complete the desquamation by rubbing them against any hard substances which may lie in their path. This action is technically termed "burnishing." After the rutting season, the horns are shed, to be again renewed in the ensuing spring; and every year they become more perfect, as represented in the accompanying woodcut, fig. 63. The letter references respectively indicate the several stages of development following upon that of the second year, in which the horn has the form of a simple unbranched stem, *a*. Like the antelopes, the stags are very swift of foot; but most of them live within, or in the immediate neighbourhood of large forests, browsing on grass, leaves, various herbs, and the shoots of young trees. Fossil remains of deer are very numerous both in tertiary and recent formations; those of the Bramatherium and Sivatherium discovered by Dr. Falkener in the Sivalik hills of Northern India, showing that in former times some members of this family attained the most gigantic proportions.

Fig. 63.



Development of the horns of the Red Deer.

THE ELK (*Alces Malchis*), or MOOSE-DEER—Plate 21, fig. 71—is an inhabitant of the northern regions of both hemispheres. It is a large and ungainly-looking animal, standing about six feet at the shoulders, and furnished with massive palmated horns, which occasionally weigh upwards of sixty pounds, and spread out laterally over a space six feet in width. The head alone measures upwards of two feet from the tip of the muzzle to the occiput, the nose being hairy and swollen out at the upper border. The eyes are small, the ears long, the neck provided with a coarse mane, the body short and rounded, and the tail only three or four inches in length. The fur is very coarse, rough, and wiry. Respecting the habits of the Elk, we may observe that it is naturally very timid, and when taken young is easily domesticated. Its movements look awkward as it glides along in a kind of shuffling, ambling trot, but when severely pressed it gallops with great rapidity. During the warm season it is gregarious and frequents low swampy grounds, often taking the water, through which it swims with marked facility; resorting in cold weather to sheltered forests. The flesh of the Elk is highly esteemed, and the hide extremely valuable.

THE REIN-DEER (*Tarandus Rangifer*), or CARIBOW—Plate 22, fig. 72—is a native of the most northerly districts of both hemispheres; being an animal of the utmost importance to the inhabitants of those icy regions. Space would fail us were we to enter minutely into a consideration of the various purposes to which this thoroughly domesticated species is applied; or if, on the other hand, we attempted to clear up the disputed point as to whether the North American and Lapland forms are one and the same species or entirely distinct; those who are interested in this question should consult Mr. Andrew Murray's Memoir, published in the *Edinburgh New Philosophical Journal* for 1858. The Rein-deer is furnished with cylindrical horns, and on account of the great variety of shape which the branches assume, any attempt to establish specific distinctions, merely on the characters of the antlers, must necessarily be attended with difficulty. The habits of these animals are too well known to be here described at any length. Elks undertake extensive migrations at different seasons, with the view of obtaining a constant supply of food, which consists, for the most part, of various species of lichen. The females are provided with four mammæ, two of which are spurious; they also support a pair of slender horns, very closely resembling those of the male.

THE WAPITI (*Cervus Canadensis*), or GREY MOOSE, is a large North American deer, standing about four feet six inches at the shoulders. The horns are cylindrical, and weigh about thirty pounds. The fur is reddish-brown; the hair on the throat of the male being much elongated, and the rump in both sexes marked by a patch of light-coloured hairs, bordered on either side with a blackish streak. The Wapiti is a stupid creature, gregarious in its habits, and often utters a peculiar shrill cry, which, like a donkey's braying, is stated to be particularly disagreeable. Its flesh is coarse and insipid.

THE RED DEER (*Cervus Elaphus*), or COMMON STAG, is a native of the more temperate regions of Europe and Asia, and though not so abundant in this country as in former days—when the chase was the peculiar delight of English noblemen—yet it is still sufficiently cared for in the wilds of Scotland and the western isles, where the deer-stalker enjoys his healthful and exciting sport. The fur of the stag exhibits a fulvous-brown hue generally, the rump being marked by a pale patch on either side of the short, stumpy tail, which is also of a light colour; in the fawn the hide is marked with whitish spots. The period of gestation in the hind extends over eight months, the young being produced in the month of May. During the winter both sexes collect in vast herds; but in the rutting season the stags frequently engage in the most desperate encounters, the struggle of a pair of males occasionally ending in mutual slaughter Sometimes the antlers are inextricably fixed by the "tynes," both animals being thus left to perish, as it were, in each other's arms!

THE FALLOW DEER (*Cervus dama*) is much smaller than the stag, and is the species most commonly seen in the parks of this country. In summer the fur is fulvous and spotted with white, but in winter it becomes blackish-brown; the rump being always more or less whitish, and banded on either side by dark streaks. The tail is dark above and white underneath. The horns are palmated superiorly; the flattened expansions being bordered with short "tynes" or dentalations. The fallow deer is now scattered all over Europe, but there is reason to believe that it was originally brought from the coast of Barbary. Black and even white varieties are not uncommon.

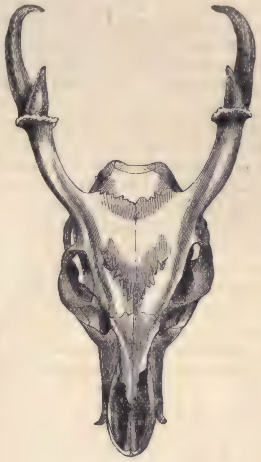
THE AXIS (*Cervus Axis*) is a remarkably elegant and permanently spotted form of deer. It commonly goes by the name of the Spotted Stag-deer. It is an inhabitant of Northern India, but freely breeds in Europe; and in its native haunts on the borders of the Ganges it is much hunted. On such occasions it often displays considerable resistance, and when brought to bay charges the horsemen with great violence. The Axis stands about two and a half feet at the shoulders; the fur having a fawn colour generally, passing into a dark brown on the back, whilst the under parts are quite white. The females are hornless.

THE ROEBUCK (*Capreolus Dorcas*) is a native of the temperate parts of Europe, and though not so abundant in this country as formerly, is still tolerably plentiful in the wilder parts of Scotland. This species is readily known by its horns, which divide into three short branches or "tynes" (Plate 21, fig. 70). The Roebuck is monogamous in its habits; the female usually producing two fawns at a birth, her period of gestation being five months. The venison of this deer is of inferior quality.

With regard to other members of the cervine family, we can only briefly notice the following:—

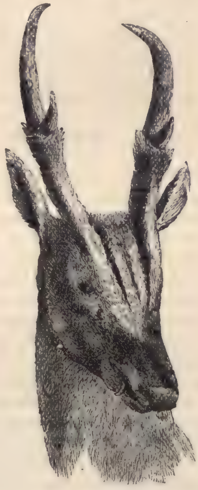
THE MUNTJAK (*Cervus Muntjac*), or Kidang. This is a very interesting species, inhabiting Hindostan, Ceylon, Java, and most of the islands of the Indian Archipelago. The distinguishing characteristics of this animal consist in the possession of two large tusk-like canines in the upper jaw, and in the columnar extension of the cranial bones, forming elongated pedestals for the support of the two-pronged horns (fig. 64). The forehead is likewise marked with three unusual foldings of the skin (fig. 65). In general appearance the Muntjak resembles the last-described species, but, whilst the body is somewhat stouter, the limbs are, on the other hand, more slender; it is also rather larger. According to Horsfield, the Muntjak "selects for its resort certain districts, to which it forms a peculiar attachment, and which it never voluntarily deserts. Many of these are known as the favourite resort of this animal for several generations. They consist of moderately elevated grounds, diversified by ridges and valleys, tending towards the acclivities of the more considerable mountains, or approaching the confines of extensive forests."

Fig. 64.



Skull of the Muntjak.

Fig. 65.



Head of the Muntjak.

The same authority states, that "the Kidang is impatient of confinement, and is not fitted for the same degree of domestication as the stag. It is, however, occasionally found in the inclosures of natives and Europeans, but requires a considerable range to live comfortably; it is cleanly in its habits, and delicate in the choice of food. The flesh affords an excellent venison, which is often found on the tables of Europeans. The natives eat the males, and always present them in a conspicuous place in their feasts; but in consequence of some peculiarities in the habits of the females, they have an aversion to them as food." The Muntjaks are monogamous, and when found in small troops, the latter usually consist only of the members of a single family.

THE MUSK-DEER (*Moschus Moschiferus*) is an inhabitant of the elevated plains of Central Asia, extending as far as the eastern provinces of China. It is about the size of the roebuck, but unlike that species, stands much higher on the haunches than at the shoulder. One of the most distinguishing peculiarities, however, arises out of the presence of a pair of long canines in the upper jaw, which in the males project outwards below the chin. Another still more distinctive feature consists in the presence of a glandular pouch in the immediate vicinity of the navel. This occurs only in the male; it is about the size of a hen's egg, and contains an unctuous brown secretion, which is the musk of commerce. A single grain of this substance is sufficiently odorous to impregnate the atmosphere of an ordinary room for several years, without apparently diminishing in quantity! The fur of the Musk-deer varies much in colour; it is more or less brownish, the throat being white, with light bands on the sides of the neck; whitish grey spots also occur along the lateral parts of the body. The ears are long and narrow. The feet are furnished with largely-developed spurious hoofs. The tail is very short. Respecting the habits of this animal, Pennant states that it is naturally shy and timid. It frequents the most inaccessible rocks, and often succeeds in evading the hunter's skill.

There are several other small kinds of Musk-deer, such as the Napu (*Tragulus Javanicus*)—Plate 23, fig. 76—and the Peesoreh (*Meminna Indica*); these are not furnished with the umbilical pouch.

FAMILY VI.—CAMELIDÆ.

The Camels differ from the typical ruminants in many important particulars. They are entirely hornless; their most distinctive feature, however, consisting in the presence of incisor teeth in the upper jaw. Altogether they have thirty teeth; eight incisors, one on either side above and six below; four canines and eighteen molars, of which latter six are spurious. Another peculiarity in this family is seen in the beautiful provision of water-cells in the walls of the paunch—of which full particulars have already been given. The feet are callous underneath, partially bisulcate, and furnished with rudimentary hoofs, which only protect the upper surface of the toes. Finally, from some other minor characters, chiefly osteological, it is clearly evident that the Camels make a decided approach towards the solid-ungulate and pachydermatous types.

THE DROMEDARY (*Camelus Dromedarius*), or ONE-HUMPED CAMEL—Plate 23, fig. 74—has been celebrated from the earliest historic times; and though no longer known in the wild state, is still abundant in the East, forming an indispensable companion to the traveller as he journeys over the wild sandy wastes of Egypt and Arabia. Well may the Arabs call this creature the "ship of the desert;" for a more elegant or appropriate title could not be devised. Bearing a heavy cargo of goods to the extent of six hundred or even a thousand pounds weight; supporting a storehouse of nourishment in the form of a huge bundle of fatty matter on its back; supplied internally with an unfailing reservoir of thirst-refreshing water; armed with sole-protecting foot-pads, in the form of broad elastic cushions, which extend for a considerable distance on either side of the toes; the camel, thus befittingly adapted for a toilsome journey, moves at the bidding of his guide; steers with undeviating course through the trackless paths of the sandy plains, and sustains with ease and cheerfulness the superabounding load! On rolls the blast with desolating waves of scorching sand; clouds of impalpable dust rise high into the air, obliterating all trace of the sunny sky; the suffocating wind threatens death to man and beast; the water-skins have parted with their treasure, and dried under the effects of intolerable heat. At length the storm has subsided, but the parched lips only tell too truly that all must perish! There is one resource left—at least such is the testimony of history. To save his earthly lord the burdened beast must die. The friend in need—who has pillowed his master's head, and warmed his chilled frame at night—must, at the hour of death, supply the life-restoring draught; thus imitating, as it were, the example of that nobler sacrifice which has conferred imperishable blessings upon mortal man! In some cases, indeed, a dire fatality carries off the whole company of the akkabah or caravan, such as happened in the year 1805, when no less than two thousand persons and eighteen hundred camels perished from the overwhelming fury of a terrible simoom. In regard to the characters by which the Dromedary is distinguished we need say little, as the solitary hump is sufficiently distinctive. For food the camel is contented with the poorest and driest of prickly herbs, but the amount taken is exceedingly moderate for so bulky an animal. In Europe these animals are little employed; but at Pisa, in Tuscany, a stud has been kept up ever since the middle of the seventeenth century; and there they breed freely. The hide, fur, flesh, &c., of the Dromedary are employed for various economic purposes, upon which it is needless to dwell.

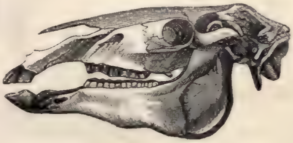
THE BACTRIAN CAMEL (*Camelus Bactrianus*) is an inhabitant of Asiatic Turkey, Persia, and the elevated plains to the north of the Himalaya mountains. It is a comparatively rare species, but easily recognized by its possessing two humps on the back. The Bactrian camel is stout, thickset, and awkward-looking, and varies very much in colour, the fur being long and shaggy, especially underneath the chin and throat. A fine example is still living in the Zoological Society's Menagerie, Regent's Park.

THE LLAMA (*Auchenia glama*) or GUANACO—Plate 23, fig. 75.—Much diversity of opinion exists as to whether two or more species of this genus are known. Some, who follow Dr. J. E. Gray, believe that there are four species; but we incline to the persuasion that this reckoning gives us at least one too many. These animals are natives of Peru and Chili, and represent, in the western hemisphere, the camels of the East. They have no humps on the back, are a much smaller species, and have a dense woolly fur, which, in the wild state, exhibits a pale chestnut-brown colour. The fur of the domesticated Llama is variously tinted. The sole-pads, instead of being broad as in the camel, are double and narrow, each division being limited to one side of the cloven foot, whilst the nails, in lieu of being weak, are powerfully developed and strongly curved. The Llamas frequent rocky places; and in consequence, therefore, of the easy separation of the toes, combined with the modifications of the pad and hoof here referred to, it becomes at once evident that such a condition of the foot is peculiarly adapted to an animal whose life is destined to be spent—unlike that of his desert-traversing congener—on the rugged slopes and precipices of the Andes. As a beast of burden, the Llama is not capable of sustaining a load of more than two hundred pounds weight, half that amount being ordinarily considered sufficiently oppressive. Attempts have recently been made to introduce the Alpaca—the *Llama Pacos*, of some authors—into Australia, and the experiment has already been attended with sufficient success to warrant the belief that ere long they will become extremely useful and abundant in the colony. The alpaca may, after all that has been urged to the contrary, only constitute a well-marked variety of the Guanaco. Though not employed as a beast of burden, it is a much more valuable animal than the Llama, the hair of the fur being much longer, and of a soft, silky texture. Respecting the Vicugna (*Llama Vicugna*), which is by all authorities regarded as a distinct species, we have only room to remark that it possesses a fine fulvous woolly fur, which is extensively employed in manufacture by the natives of Peru.

ORDER X.—SOLIDUNGULA.

IN the arrangement of Cuvier, the solidungulate quadrupeds form the third family of the order Pachydermata; but, by general consent, it is admitted that the present group is worthy of being separately treated in the manner here proposed. In Professor Owen's system, the solidungulates constitute a subdivision of his odd-toed ungulates or Perissodactyla. The members of this order are at once characterized by the circumstance of their possessing, or rather appearing to possess, only a single toe, which is incased in a solid box-like hoof; there are, however, on either side of this large central toe, rudimentary digits, in the condition of two splint-like bones, corresponding to the second and fourth metacarpal and metatarsal bones of the human extremities. Another distinguishing feature is seen in the dentition, which is made up of forty teeth; twelve of these are incisors, equally divided above and below; four are canines, the upper being almost invariably absent in the female; the remaining twenty-four being molars, whose crowns are flat and square-shaped, and marked by four crescentic folds of enamel—those of the upper jaw having a small additional fold at the inside. If the accompanying figure be examined it will be noticed that a considerable interspace exists between the incisors and the anterior grinders (fig. 66); it is through this vacuity that the bit is introduced for the purpose of controlling and directing the horse's speed. The stomach of the solidungulates is simple and undivided; the cœcum and large intestines being extremely capacious, and the gall-bladder entirely wanting. Finally, it may be remarked that fossil solidungulate remains have been found in the tertiary deposits of various parts of the world, but it is impossible to determine how many species of the order may have roamed over the uncultivated plains of geologic time.

Fig. 66.



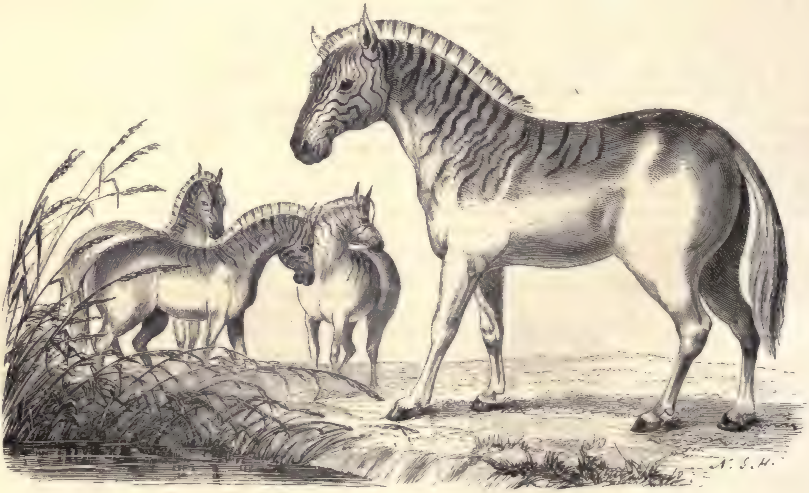
Skull of the Horse.

FAMILY—EQUIDÆ.

All the members of the order may be associated together under a single family title, as above, or they may be considered as belonging to a single genus. The family characters are the same as those of the order. All existing species were originally inhabitants of the eastern hemisphere—the mountain plains and wastes of Asia and Africa constituting their native abode. In the wild state they are gregarious; their speed is swift, and grass forms the principal element of their food.

THE HORSE (*Equus Caballus*)—Plate 24, fig. 77—is of all animals the most highly esteemed, and deservedly so. Although it does not prove such a valuable source of food as certain of the ruminants; nevertheless, in an indirect manner, it supplies us with the means of procuring sustenance from various sources, proving absolutely indispensable to the agriculturist. To enter into a history of the uses to which this matchless quadruped has been put, or to enumerate the countless varieties of breed into which it has passed, would lead us far beyond the limits assigned to our description of the present family; suffice it to say, that all the well-known domesticated forms are only varieties of an original wild stock, and that it is doubtful if this original type exists in the condition of its native progenitors. It is true that thoroughly wild breeds roam at large over the wild steppes of Asia and the spacious plains of South America; but all these are believed to have returned to this state from that of a more or less complete form of domestication. Of the several characters which specifically distinguish the horse from its congeners, it is perhaps only necessary to particularize the "flowing mane and flying long-haired tail," associated with a pair of moderately developed ears, and callosities both on the fore and hind legs. In the wild state the head is larger than in the finer domesticated breeds. "The horse," says Mr. Rarey, "according to the best accounts we can gather, has been the constant servant of man for nearly four thousand years, ever rewarding him with his labour, and adding to his comfort in proportion to his skill and manner of using him; being to those who govern him by brute force, and know nothing of the beauty and delight to be gained from the cultivation of his finer nature, a fretful, vicious, and often dangerous servant; whilst to the Arab, whose horse is the pride of his life, and who governs him by the law of kindness, we find him to be quite a different animal. The manner in which he is treated from a foal, gives him an affection and attachment for his master, not known in any other country. The Arab and his children, the mare and her foal, inhabit the tent together; and although the colt and the mare's neck are often pillows for the children to roll upon, no accident ever occurs, the mare being as careful of the children as of the colt. Such is the mutual attachment between the horse and his master, that he will leave his companions at his master's call, ever glad to obey his voice. And when the Arab falls from his horse, and is unable to rise again, he will stand by him and neigh for assistance; and if he lies down to sleep, as fatigue sometimes compels him to do in the midst of the desert, his faithful steed will watch over him, and neigh to arouse him if man or beast approaches. The Arabs frequently teach their horses secret signs or signals, which they make use of on urgent occasions to call forth their utmost exertions." These are the words of the master and author of "The Modern Art of taming wild Horses." Few men have done more to perfect the method of treating this gifted animal than has Mr. J. S. Rarey; but space compels us to desist from enlarging on a subject, to which special works are necessarily devoted.

Fig. 67.



The Quagga (Hippotigris Quagga).

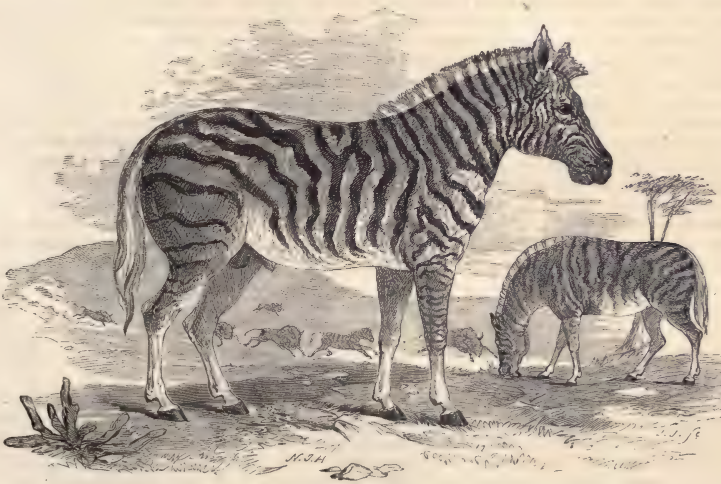
THE QUAGGA (*Hippotigris Quagga*).—If naturalists are prepared to admit the propriety of generically separating the horse from the ass, we may respect the opinion of Colonel Hamilton Smith, who has considered the zebras worthy of similar distinction. Their characters are evidently osculant between the two abovementioned animals; and we are not prepared to accept the opinion of those who believe that their asinine features maintain the ascendancy. The Quagga is a native of South Africa, and is especially abundant on the open plains below the Vaal river, where it herds in immense numbers. The ears and tail are decidedly equine; the neck is furnished with an erect mane, banded alternately brown and white. The upper parts of the hide are rufous-brown; the head, neck, and shoulders being lined with dark stripes, which become fainter as they approach the middle of the back. The chest, belly, legs, and tail, except at the root, are quite white. If there be preponderance on either side, surely these characters lean rather to the equine than the asinine group. All along naturalists have exhibited singular discrepancies of opinion in regard to this animal. It is now many years since the Zoological Society's Gardens first displayed living examples of the Quagga; but, as

Captain Harris justly remarks, the period is not remote when confusion rode rampant on the question under consideration! "Disguised in a tail borrowed from the rump of the domestic ass, the subject of the annexed portrait (fig. 67) sat for its picture to M. Buffon, and may be found in the voluminous works of that eminent author, doing duty for a *female zebra!* Even Baron Cuvier has fallen into the error of describing the Quagga to be the proprietor of an asinine tail—a mistake which is the more surprising since it is stated by the same author in his 'Règne Animal,' that 'among the equipages occasionally exhibited in the gay season in Hyde Park, and other fashionable places of resort, may be seen a curricle drawn by two couaggas, which seem as subservient to the curb and whip as any well-trained horses.'" The average height of the Quagga is about four feet and four inches at the shoulder. In its native haunts it is sociable and peaceable; but if roused by an enemy it exhibits great courage, and is said to repel the attacks of large carnivora, on some occasions at least, successfully. Its voice is not unlike the bark of a dog.

THE ZEBRA (*Hippotigris Zebra*), or WILDE PAARD of the Cape colonists—Plate 24, fig. 79—occupies the mountainous parts of Southern Africa. It is somewhat less in height than the Quagga; the mane being erect and bushy, with alternating bands of black and white. The entire body, head, and limbs are striped with narrow black bands, the upper ones being united to the central longitudinal streak on the back. The general ground-colour of the hide is white. The hoofs are narrow, and much hollowed out at the sole. Zebras are very shy and gregarious in their habits, living in troops sometimes numbering upwards of a hundred individuals. In a domesticated state numerous hybrids have been produced by association with the horse and ass. The flesh of the zebra, though eatable, is coarse, oily, and unpalatable. According to the testimony of Mr. Andersson, the subdued neighings of the Zebra have a very melancholy character when heard at a distance; and, on one occasion, this enterprising sportsman mistook its moribund groanings for the gasping ejaculations of a drowning man. The female is furnished with two mammæ.

BURCHELL'S ZEBRA (*Hippotigris Burchellii*) is an inhabitant of the plains of Southern Africa to the north of Orange river. The Cape colonists call it *Bonti Quagga*, and by the native Bechuana and Matabili it is termed the *Peechey*. It stands about four feet six inches high at the shoulder, and is a comparatively stout-built species. The mane is erect, five inches in depth, and more or less marked by alternating bands of black and white. The muzzle is black; the ears and tail being thoroughly equine in character. The head and upper parts of the body have a reddish-brown ground colour, being beautifully streaked by irregularly sinuous, broad, black bands, which do not unite with the longitudinal dorsal line; the latter widens towards the croup. The tail, legs, and under parts of the chest and belly are quite white (fig. 68). The female is similarly marked, and is furnished with four mammæ. Like its congeners, Burchell's zebra admits of being tamed; but, under the most favourable circumstances, it is considered unsafe, obstinate, and treacherous. Respecting its habits and appearance in the wild state, none have so effectively written upon this subject as Captain Harris:—"Fierce, strong, fleet, and surpassingly beautiful, there is perhaps no quadruped in crea-

Fig. 68



Burchell's Zebra (Hippotigris Burchellii).

tion, not even excepting the mountain zebra, more splendidly attired, or presenting a picture of more singularly attractive beauty, than this free-born of the desert. It would be difficult to convey to the uninitiated a suitable idea of the sparkling effect produced by their vivid and strikingly-contrasted colours, when seen pawing the valley in all the pride of conscious liberty, or flying in compact columns before the equestrian foe." Warming up with the vision of a mighty herd bounding over the sandy main, our eloquent author continues :—" Anon, a dark pillar of dust rises from the plain, and undisturbed by any breath in heaven, mounts upward to the clear azure sky like a wreath of smoke—three ill-omened vultures soaring in circles above it. Nearer and more near rolls on the thickening column, until several dark living objects are shortly perceived dancing beneath it. Emerging from the obscurity, their glossy and exquisitely variegated coats, glittering in the sun's rays, *ventre au terre*, the head of a column of Burchell's zebras next appears, and instantly afterwards the serried horde sweep past in gallant array; their hoofs clattering on the hard ground like a regiment of dragoons. Tearing by at racing speed, straining neck and neck with their shaggy whimsical-looking bovine allies (*i.e.* Brindled Gnoos), their own striped and proudly curved necks seem as if they were clothed with thunder, and their snowy tails are streaming behind them. Now the troop has wheeled and halted for an instant to survey the foe. A powerful stallion advances a few paces with distended nostrils and stately gait; his mane newly hogged, and his ample tail switching his gaily checkered thighs. Hastily reconnoitring the huntsman, he snorts wildly, and instantly gallops back to his cohort. Away they scour again, neighing and tossing their striped heads aloft, switching their light mule-like tails in all the pride of fleetness and freedom. Another halt and another *reconnoissance*. Her small equine ears laid viciously down, a skittish mare has now fallen out of the ranks, and is in the act of delivering both her active heels plump into the ribs of an admirer, whose wantonness has prompted him to seize a tempting opportunity for inflicting upon her sternum an amorous bite; and now, with a neigh of exultation and a vain-glorious toss of her coquettish head, free and unfettered as the wind, away she careers again, still waited upon by her lover, who is nothing daunted by his rebuff; and their forms are finally concealed by the cloud which follows the heels of the again retreating squadron." A gorgeous specimen of this truly beautiful species, may now be seen in the Regent's Park menagerie.

THE ASS (*Asinus vulgaris*) has been generically separated by Dr. J. E. Gray, and is readily distinguished from the various kinds of horse by its tail, which is clothed with short hair at the upper part, and only tufted at the extremity; the hind legs being likewise devoid of warty callosities. The fur has a grey colour, and exhibits a dark streak along the central line of the back, crossed by a similar band running over the shoulders. The ears are of great length; the forehead being also slightly arched. Respecting the qualities of this animal, we need say little. No unfortunate beast of burden is so much neglected on the one hand, or maltreated on the other. As to its origin, naturalists are divided in opinion; some maintaining that it is a domesticated variety of the Koulan, or wild ass of Persia (*Asinus onager*), others believing that the last-named is only the domestic animal which has returned to a wild state—the original stock having altogether disappeared. Whichever view is correct, we think there can be little doubt that the two forms are specifically identical, and consequently that they have descended from a common parent.

THE KIANG (*Asinus Hemionus*), or TSCHIKITEI, is another kind of wild ass, intermediate in character between the above-described species and the horse. The ears are of moderate length, the fur is smooth, and of a bright rufous-bay tint; the legs having a pale straw colour. A dark broad streak runs along the central line of the back, but it is not crossed by any similar band over the shoulders. The Kiangs herd together in small numbers, roaming over the sandy steppes of Central Asia. The males are fine animals, standing sometimes as much as fourteen hands high at the shoulder; and, moreover, they neigh like horses. A noble specimen has been recently brought over to this country, and may be seen in the Zoological Society's Menagerie, Regent's Park.

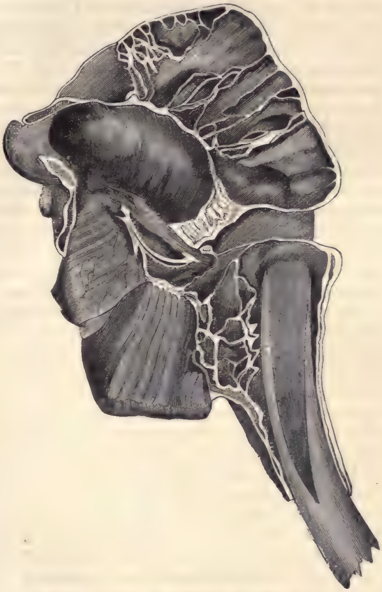
ORDER XI.—PACHYDERMATA.

ALTHOUGH naturalists are divided in opinion as to the best mode of classifying the non-ruminating hoofed quadrupeds, all are agreed that the dissimilar groups, collectively associated by Cuvier under the title of Pachydermata, cannot fairly be regarded as zoologically equivalent to the Ruminantia. It is in this view that we have adopted a somewhat modified outline of the Cuvierian arrangement, while at the same time we are prepared to recognize the more perfected idea developed in the recent classification of the Mammalia by Professor Owen. The Pachydermata, as here retained, can scarcely be recognized as having any special characteristic common to the entire order, unless we are permitted to notify the more or less hardened skin, which is to a considerable extent naked or destitute of hair. In our opinion, too much stress has been laid upon this dermal peculiarity, seeing that it is shared by many other Mammalia, and is in no wise distinctive; the order has, however, derived its name from this trivial circumstance. Hitherto we have detailed the more remarkable features of the several natural groups in a general introduction to each order; but such is the variety of character presented by the several families in the present instance, that it is better to reserve these particulars for separate consideration.

FAMILY I.—ELEPHANTIDÆ.

Excluding the oceanic cetacea, the living representatives of this family are the most bulky of all existing Mammalia. In the miocene and pleistocene deposits of the tertiary epoch, the remains of extinct species are extremely abundant; some of them—such as the mastodon, Plate 32, fig. 100, and deinotherium—being generically distinct. Probably the latter genus should be regarded as the type of a separate family, seeing that the lower jaw is supplied with enormous tusks, in a manner altogether unique; their crowns being directed downwards and backwards, and the roots inserted into a prolongation of the symphysis or anterior central prominence of the inferior maxillary bone. Whatever differences may have existed in these aberrant forms, the true elephants are distinguished by the possession of a remarkable nasal appendage or proboscis, commonly called the "trunk." This organ has a tapering cornucopial outline; it is pierced at the tip for the two nostrils, and at the centre of the upper margin is furnished with a finger-like process which, in conjunction with a thumb-like thickening of the inferior border, serves the purpose of a hand. The extraordinary prehensile powers of the trunk are familiar to every one; but when it is considered how readily the same instrument can detach a straw or uproot a tree, our conceptions of its muscular and tactile powers can scarcely be too highly exalted. Another peculiarity in the organization of these proboscidean pachyderms has reference to the bulky aspect of the head. This feature, however, is not due to any increased development of the brain, but simply to a remarkable extension of certain air sinuses in connection with the cranial bones (fig. 69). The vertical elevation of the forehead thus conferred upon the elephant, has led many to ascribe to the animal an almost super-quadrupedal intelligence; but if, in this case, their opinions are based upon phrenological considerations, it is our duty to inform such enthusiasts that the frontal prominence and elevation of the cranial vertex bear no relation whatever to the bulk of the brain contained within the comparatively restricted cerebral cavity. That elephants possess considerable sagacity, no one will venture to deny; but that they display this mental quality in virtue of any corresponding enlargement of the great nervous centre, is utterly inadmissible. Another interesting peculiarity in this family consists in the form and arrangement of the teeth. Ordinarily, it is stated that the dentition comprises two incisors, no canines, and three molars; but in reality the grinders are more numerous, no less than seven being consecutively developed on each side of either jaw. This apparent discrepancy results from the circumstance, that only two molars are present on one side of either jaw at the same time; but, in the progress of growth and age, those first employed give way to a succession of similar teeth developed from behind. In like manner the two large permanent incisors are preceded by a similar pair, which, however, have never attained full development. Histologically speaking, the tusks consist entirely of dentine, which, on transverse section, exhibits an elegant series of decussating curvilinear striæ. This appearance is peculiar to the ivory of elephants, and considerably enhances its commercial value. In a structural point of view, the molars are still more remarkable. If reference be made to Plate 32, fig. 102, it will be observed that the grinding surface is marked by a number of parallel bars. These consist of alternating plates of the three different substances which ordinarily enter into the composition of the mammalian tooth; the white bands representing plates of *enamel*, each inclosing a central lamina of ivory or *dentine*, whilst the several outer spaces between these formations are filled up with a special osseous development termed *cement*. In the African elephant the enamelled plates have a lozenge-shaped outline, as seen in Plate 32, fig. 101; in the Siberian mammoth, or *Elephas primigenius*, they are more numerous and closely approximated; and in the mastodon are elevated into a series of tuberculated cones. In regard to the skeleton, we may remark the general massiveness of all the bony elements, the twenty pairs of ribs reaching backwards almost to the pelvis, the remarkable breadth of the scapula in proportion to its length, the prodigious development of the external condyle of the humerus, the simple form of the femur, the peculiar articulation of the superior extremity of the radius, and the odd-toed, pentadactylous feet. The digestive organs are extremely bulky as in herbivorous quadrupeds generally. The gall-bladder is complicated by numerous internal septa, and intimately connected with the walls

Fig. 69.



Vertical Section of the Skull of the Elephant.

of the intestine. The mammæ are two in number, situated beneath the anterior part of the chest. Elephants herd together in considerable numbers, subsisting entirely on vegetable matters.

THE INDIAN ELEPHANT (*Elephas Indicus*)—see Frontispiece—is a native of the peninsula from whence it derives its specific name; and also of Ceylon, Sumatra, and Borneo. From the earliest times it has been employed as a beast of burden; and in European menageries it has ever formed one of the most attractive objects of amusement to natural history loving people. It is distinguished from the African species by its oblong head, which is concave anteriorly; by the character of the enameled ridges on the crown of the molar teeth already described; by the comparative smallness of the ears; by the very short tusks of the female; by the paler colour of the hide; and by the circumstance of its having four nails on the hinder feet. It is not our intention to dwell at any length upon the habits of the elephant in a tame or semi-domesticated state, otherwise we should be led to record numerous anecdotes in which the sagacity of this animal has been very unduly exaggerated and embellished with erroneous statements. The following particulars, however, will be found interesting:—"Elephants," says Captain Williamson, "have a great dislike to camels, though they will travel with them, when laden, without showing it much. Nothing distresses this majestic animal more than being closely followed by a horse, especially at a canter or other quick pace. Probably the clattering of his hoofs creates alarm. An elephant cannot bear the approach of dogs, or other small quadrupeds; and if, in proceeding through a grass jungle, game should start near him, he will frequently evince great uneasiness. In heavy covers elephants are of infinite service, their bulk, and the noise occasioned by their movements, often rousing game which would else remain secreted, and their height giving a commanding view to their riders." Elephants have likewise a particular hatred of the rhinoceros, and can scarcely be induced to approach within sight or smell, even though the animal be dead. Their disposition is extremely capricious in the tame state, and their mode of resenting real or fancied insults is often attended with terrible destruction to life and property. Instances of this are too well known to need illustration. For the capturing of elephants in the wild state, various methods are adopted in different parts of India. The most usual mode is by driving them into a *keddah*, or large inclosure surrounded by a deep trench and external paling, strongly built, and propped from without by large wooden beams. Several thousand natives are employed in frightening and driving them into this decoy; but the operation is usually attended with much difficulty. When once secured within the area, their subsequent submission and domestication is only a work of time. Another mode of taking them is by means of *koomkies* or decoy elephants; these are females taught to simulate wanton wiles; and being conducted by their drivers to the *saun*, or isolated male, which they propose to take, the unsuspecting beast is secured by the mahouts whilst engaged in the all-absorbing pleasures of courtship and fancied secrecy. Ropes being passed round his legs, and the hind pair having been fastened to a tree, the drivers now steal from beneath his body, and the koomkies leave the beast to his fate. On detecting the snare, he becomes perfectly furious, destroying whatever may be in his way, "tearing up the tufts of grass by the roots, rending from the tree such branches as may be within his reach, and eventually straining to throw down the tree itself by his weight, or to pull it up with his trunk. In short, his whole powers are in action on this occasion; and it is not until being completely overcome with fatigue, and nearly dead from his natural thirst, which is greatly augmented by constant roarings, that he subsides into a sort of tranquillity." In a day or two he takes food from the *mahouts* who constantly visit him; and at length he permits himself to be conducted to the home of the successful proprietor. A third mode of capturing the elephant is by means of the *phaun* or slip knot. This consists of a stout rope, ten or twelve yards long, and at least an inch in thickness, with a sliding noose at the free extremity. A single small-sized elephant being selected out of a herd, a skilful mahout, mounted on a tame elephant, gives chase; and throwing the loop over the animal's head, he soon moderates or checks its progress by tightening the cord. The breathing becoming straightened, the driver is not long in acquiring entire control over his captive, which is ultimately conducted to a place of security. A fourth plan consists in digging pits; but this method is highly objectionable, as the animal sometimes sustains irremediable injury. Before concluding we may remark that the Indian elephant rarely exceeds nine feet in height; the average stature being about eight feet at the shoulder. The tallest specimen ever known in Bengal measured, it is said, nearly twelve feet, and was proportionately bulky. Mr. John Corse, however, who kept a large establishment for the rearing of elephants at Tipperah, has stated, in a memoir communicated to the Royal Society in 1799, that the largest species he ever heard of did not exceed ten feet six inches. The same authority states that the period of gestation in the female, extends over a space of twenty-two months; only one young being produced at each birth.

THE AFRICAN ELEPHANT (*Elephas Africanus*) occupies an extensive range in the interior plains and forests of the continent from whence it derives its specific title. As already hinted, it is at once distinguished from the Asiatic species by the remarkable size and expanse of the ears, by the presence of well-developed tusks in the female, by the darker aspect of the skin, by the lozenge-shaped ridges of enamel on the crowns of the molar teeth, and by the presence of only three nails on the hinder feet. The male attains a height of twelve feet at the shoulder, and is on an average taller than its Indian congener; its tusks are much larger, measuring between eight and nine feet in length, and weighing upwards of a hundred pounds, those of the female being four feet long. The weight of ivory of various kinds annually brought over to this country is said to amount to four hundred and sixty-eight tons, which is equivalent to a sum of about £300,000 sterling;

and as it also appears that at least fifty-two thousand elephants' tusks are imported, it necessarily follows that twenty-six thousand of these gigantic animals are yearly put to death to satisfy our demand for its valuable incisor teeth! If the present species, therefore, did not occupy an extensive area of distribution, a very few years would, at this ratio of destruction, suffice to render it altogether extinct. The improvements in fire-arms have rendered the slaughter of this beast a matter of comparative ease; and looking back on the page of history, it is not a little curious to observe the ridicule cast upon the statements of those who first, single-handed, undertook hunting expeditions into the interior of Africa. We even find the distinguished author of the "Oriental Field Sports" severely questioning the veracity of Monsieur Vaillant, who, at the close of the last century, published an account of his sporting successes in the plains of the great African continent. "No native of Bengal, nor any European resident *there*," says Captain Williamson, "would undertake such a piece of rashness as to go out shooting wild elephants!" Time, however, silently works progress, and our libraries now teem with records of daring adventure with this most formidable proboscidean pachyderm. Dr. Livingstone has borne testimony to the substantial accuracy of Mr. Gordon Cumming's writings, and we are not aware that any one has thought it necessary to doubt the no less remarkable statements and experiences of Mr. Charles John Andersson. Some of Mr. Cumming's exploits appear to have been accompanied with unnecessary cruelty, which is the more to be regretted, as, under ordinary circumstances, the manifest sufferings of these huge mammals in the agonies of death should be sufficient to excite sympathy, and induce the sportsman to deprive them of life in the swiftest manner possible. The behaviour of the young when deprived of a parent is particularly worthy of remark. Thus, Captain Harris having shot a female elephant whilst hunting in Cashan mountains, was much struck with the subsequent conduct of its helpless calf. It was about three and a half feet high, and emerged from a bush, uttering mournful notes. "We had observed the unhappy little wretch," he says, "hovering about its mother after she fell, and having probably been unable to overtake the herd, it had passed a dreary night in the wood. Entwining its little proboscis about our legs, the sagacious creature, after demonstrating its delight at our arrival by a thousand ungainly antics, accompanied the party to the body of its dam, which, swollen to an enormous size, was surrounded by an inquest of vultures. Seated in gaunt array, with their shoulders shrugged, these loathsome fowls were awaiting its decomposition with forced resignation; the tough hide having defied all the efforts of their beaks, with which the eyes and softer parts had been vigorously assailed. The conduct of the quaint little calf now became quite affecting, and elicited the sympathy of every one. It ran round its mother's corpse with touching demonstrations of grief, piping sorrowfully, and vainly attempting to raise her with its tiny trunk. I confess I had felt compunctions in committing the murder the day before, and now half resolved never to assist in another; for, in addition to the moving behaviour of the young elephant, I had been unable to divest myself of the idea that I was firing at my old favourite, *Mowla-Bukhsh*, from whose gallant back I had vanquished so many of my feline foes in Guzerat." The captain, nevertheless, recovered himself sufficiently to assist in hewing out the tusks, an operation of no small difficulty even in the female. The elephant calf was next conducted to the waggons, but perished in the course of a few days, as did two others much older, which they afterwards captured. This also leads us to remark, that, notwithstanding the anxiety which naturalists have displayed in regard to the importation of a living African elephant, and the care with which they have conducted the preliminary operations, all their efforts have as yet failed to prove successful. In a very recent attempt, the young proboscidean perished before it had left the shores of its native country. With regard to the experiences of other African adventurers, some of them possess a thrilling interest, and to those whose conceptions of the delights of hunting rise in proportion to the narrowness of escapes encountered, we particularly commend the following most extraordinary adventure:—On a magnificent tropical moonlight night, Mr. Andersson, alone, as usual, took up his position on a narrow neck of land between two pools of water. He was protected by a small *skärm*, built of stones, and had with him two or three guns and a blanket. Presently a noise like the passage of a train of artillery broke upon his ear, and an immense elephant appeared, followed by others, to the number of eighteen. "Their towering forms told me at a glance," says Mr. Andersson, "that they were all males. It was a splendid sight to behold so many huge creatures approaching with a free, sweeping, unsuspecting, and stately step. The somewhat elevated ground whence they emerged, and which gradually sloped towards the water, together with the misty night air, gave an increased appearance of bulk and mightiness to their naturally giant structures. Crouching down as low as possible in the skärm, I waited, with beating heart and ready rifle, the approach of the leading male, who, unconscious of peril, was making straight for my hiding-place. The position of his body, however, was unfavourable for a shot; and, knowing from experience that I had little chance of obtaining more than a single good one, I waited for an opportunity to fire at his shoulder, which is preferable to any other part when shooting at night. But this chance, unfortunately, was not afforded till his enormous bulk towered above my head. The consequence was, that while in the act of raising the muzzle of my rifle over the skärm, my body caught his eye, and, before I could place the piece to my shoulder, he swung himself round, and with trunk elevated and ears spread, desperately charged me. It was now too late to think of flight, much less of slaying the savage beast. My own life was in imminent jeopardy; and seeing that if I remained partially erect he would inevitably seize me with his proboscis, I threw myself on my back with some violence, in which position, and without shouldering the rifle, I fired upwards at random towards his chest, uttering, at the same time, the most piercing shouts and cries. The change of position in all human probability saved my life, for, at the same instant, the trunk of the enraged animal descended precisely on the spot where I had been previously couched, sweeping away the stones, many of large size, that formed the fore part of my skärm, like so many pebbles. In another moment his broad fore-feet passed directly over my face. I now expected nothing short of being crushed to death; but imagine my relief when, instead of renewing the charge he swerved to the left, and moved off with considerable rapidity—most happily without my having received other injuries than a few bruises, occasioned by the falling of the stones." Notwithstanding all this, Mr. Andersson snatched up another rifle, and, taking aim, pulled the trigger, when the piece missed fire; had this happened in the first instance, nothing could have prevented his immediate destruction!

FAMILY II.—RHINOCERIDÆ.

The Rhinoceroses are at once recognized, not only by their peculiar solitary or double horns, but also by their thick, scabrous, tuberculated skin, which, falling into distinct folds over various regions of the body, resembles an artificial defensive armature. The horns are strictly integumentary, being composed, as it were, of numerous bristles firmly bound and incorporated together. The head is much elongated; the jaws supporting, in young individuals, thirty-six teeth, that is, eight incisors and twenty-eight molars. Of the latter, those in the upper division have subquadrate crowns, surmounted by two transverse ridges; whilst the crowns of the lower series are narrower, more elongated, and marked by curved lines, whose concavity is turned inwards. The superior incisors are much compressed, and directed obliquely forwards; those of the lower jaw being large and pointed. The outer incisors above, and the two inner below, are very small and concealed. Among the principal skeletal peculiarities, we may mention the remarkably thick, rough, elevated, and arched nasal bones, the general massiveness of all the osseous elements, the presence of nineteen pairs of ribs, the complete development of the ulna and fibula, the forked spine of the pelvis, and the existence of only three series of digital phalanges. The digestive canal is about eight times as long as the entire body. Rhinoceroses feed upon coarse herbage, and are natives of the warmer regions of the Eastern hemisphere.

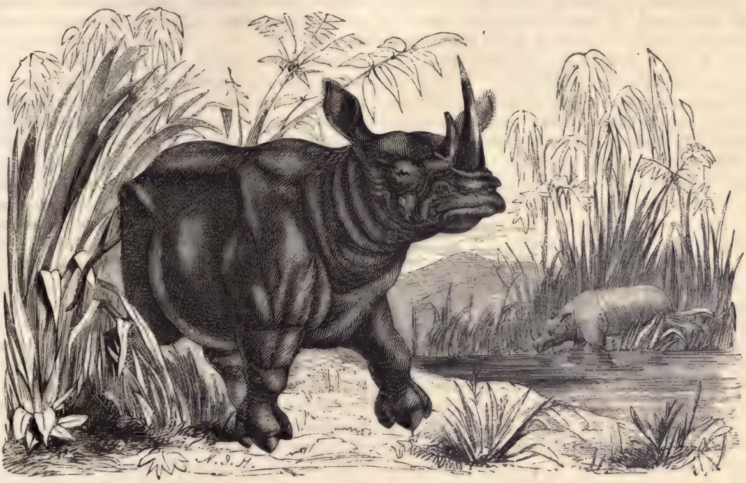
THE INDIAN RHINOCEROS (*Rhinoceros Indicus*) is the species best known—Plate 25, fig. 80—and was formerly termed *R. unicornis*, in contradistinction to *R. bicornis;* but, as Van der Hoeven has very justly remarked, these terms ought no longer to be retained, because we are now acquainted with six or seven distinct species, two of them being furnished with a single horn each, and the others with two horns. The species under consideration enjoys a pretty extensive range in Eastern India, Siam, and Cochin China, being especially abundant on the borders of the Ganges. It is chiefly found in dense jungles and shady forests, far from the haunts of man. It is remarkably savage, and attacks elephants without the slightest compunction; and seems to take a wanton delight in destroying every living creature that comes within its reach. This animal has a singular habit of dunging in one spot; and these high dung-heaps, while they serve the purpose of indicating to other animals that danger is nigh, also afford to the native sportsman a means of guiding him as to the best spot for erecting platforms from which he secures his victim. The skin of the Indian Rhinoceros, when dried, will take a high polish, and as it is more or less capable of resisting the force of a leaden bullet, fetches a high price; the fat is also much used by the native doctors as an unguent.

THE JAVANESE RHINOCEROS (*Rhinoceros sondaicus*) also possesses only a single horn. It is distinguished from the preceding, however, by the comparatively slender head, by the proportionally elevated legs, by the character of the dermal armour, consisting of numerous polygonal scutes, whose centres are depressed and give origin to short bristly hairs, the ears being also bordered by long, stiff, and closely-set bristles. The tail is hairy underneath. By the Javanese this animal is also called the *Warak,* and it is sometimes described as *Rhinoceros Javanus*, a title given to it by F. Cuvier; the one here adopted being that employed by Baron Cuvier and Dr. Horsfield. According to the latter, the Warak is gregarious in its habits, and forms deeply excavated retreats along the declivities of mountains and hills. It does not appear to possess the ferocious character of its Indian congener; but at night-time it frequently causes serious damage to coffee and pepper plantations.

THE SUMATRAN RHINOCEROS (*Rhinoceros Sumatrensis*) possesses two horns, and was formerly confounded with one or other of the African species. The posterior horn is very short, conical, and placed a little before the eyes. The hide is rough and slightly provided with hairs; the foldings of the skin being quite inconspicuous. It is shy in disposition, and is seldom seen near the haunts of men.

BRUCE'S RHINOCEROS (*Rhinoceros Africanus*) is the form most commonly known in Africa, and is more frequently described under the vague titles of the African and the Two-horned Rhinoceros. It is the *Gargatan*, or *Rhinaster* of the Cape Colonists, the *Chukuroo* of the Matabili, and the *Borele* of the Bechuanas. Neither of the horns are of very great length, the posterior one being comparatively short; both have a greenish-brown tint. The hide exhibits a yellowish-brown colour, being fleshy underneath, and not furnished with folds. The tail is about two feet long, and bristly at the tip. The habits of Bruce's Rhinoceros closely resemble those of the Indian species. It is remarkably savage and dangerous to approach when wounded. Mr. Andersson mentions an instance where some Namaquas had shot one of these animals as it was rising from its sleep. One of the party, imagining it to be dead, approached, mounted, and stabbed the carcase. "The beast, however, had only been stunned; and as soon as he felt the cold steel enter his body, he started to his feet and made off at full speed. This action was so instantaneous as to prevent the man from dismounting, whilst the other Namaquas were paralyzed with fear. Fortunately, however, after the beast had run forty or fifty paces, he suddenly stopped short, and looked round. The favourable opportunity was not lost; for one of the party, more courageous than the rest, instantly fired, and, as good luck would have it, brought the animal to the ground with his terror-stricken rider clinging to his back." The same distinguished traveller remarks, that when the Rhinoceros is shot, it usually falls forward on the knees, and not on its sides—a result which seems explicable from the great breadth of the body combined with shortness of the limbs. The Gargatan feeds on the shoots, roots, and young branches of the wait-a-bit thorn.

Fig. 70.



Burchell's Rhinoceros (Rhinoceros simus).

SLOAN'S RHINOCEROS (*Rhinoceros Keitloa*) is better known as the Keitloa, and easily distinguished by its horns, which are nearly of equal length; the anterior horn being cylindrical, and curved backwards near the tip; the other compressed and almost straight throughout. The hide exhibits a brownish-yellow colour, pretty closely resembling the above; but there is a black mark on the inside of the thigh. Both these species are commonly termed "black," in contradistinction to the two succeeding white species. The Keitloa is an extremely morose, sulky, and savage beast, and when wounded becomes perfectly maddened with rage. Mr. Andersson nearly lost his life by the repeated attacks of a female, whose leg he had broken by a shot. One of her horns ripped up his right thigh from near the knee to the hip; and having sustained at the same time severe bruises and internal injury, his ultimate recovery was only effected after prolonged and painful suffering. The Keitloa is very swift of foot. Notwithstanding their apparent ungainliness, all the rhinoceroses possess the power of rapid progression to a greater or less extent.

BURCHELL'S RHINOCEROS (*Rhinoceros simus*) is known as the White Rhinoceros, or the *Witte Rhinaster* of the Cape Colonists; being also termed the *Chicore* by the Matabili and *Monoohoo* by the Bechuanas (fig. 70). It is distinguished from the foregoing, not merely by the pale whitish-brown colour of the hide, but more particularly by the remarkable elongation of the head, which measuring about four feet from the muzzle to the ears, nearly equals one-third of the entire length of the body! It is also further characterized by a much greater bulk and size, as compared with the above; the nose being likewise square-shaped. The full-grown anterior horn is three feet in length, sharp at the point, and curved backwards. The disposition of this species is comparatively mild; and, unlike that of its black congeners, its food consists entirely of grasses.

OSWELL'S RHINOCEROS (*Rhinoceros Oswellii*) was, in the first instance, scientifically indicated as a distinct species by Dr. J. E. Gray of the British Museum. By the Bechuanas it is termed the *Kobaaba*. In point of size and general appearance, this animal closely resembles the foregoing; but, observes Mr. Andersson, "it is with regard to their horns that the two species chiefly differ from each other; for whilst the anterior horn of the monoohoo has an average length of two or three feet, curving backward, that of the Kobaaba not unfrequently exceeds four feet, and is slightly pointed forward, inclining from the snout at an angle of forty-five degrees. This rhinoceros is also the rarer of the two, and is only found in the more interior parts of South Africa." The posterior horn is about a foot long, short, conical, broad at the base, and narrow at the tip; the extremity of the anterior horn being sharp, and worn away in front by friction on the ground.

FAMILY III.—HIPPOPOTAMIDÆ.

The Hippopotamuses formerly occupied an extensive area of distribution, as may be gathered from the numerous fossil remains occurring in the tertiary beds of Great Britain and Europe. At least five or six distinct species have been indicated. Taking our living African example as a type of the family, its principal distinguishing characteristics may be described as follows. The body is clothed with an almost naked skin; the abdomen nearly reaching to the ground. The head is broad and flat, and furnished with thirty-eight or forty teeth; there being eight incisors, four canines, and from twenty-four to twenty-eight molars, according to the age of the animal. The inferior incisors project horizontally forwards, the central pair being the longer. The worn crowns of the large canines are perfectly smooth and opposed vertically. The posterior molars are large and complicated. The ears are remarkably short; the head terminating anteriorly in a broad, abrupt muzzle, whilst the nostrils are much elevated. The feet are tetradactylous, the digits being armed with small hoofs. The tail is short. Hippopotamuses are heavy, awkward-looking animals on land; but they display a singular agility and gracefulness of motion in water. Aquatic plants, and especially grasses, constitute the bulk of their food.

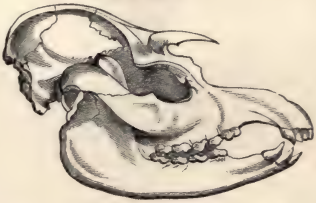
THE HIPPOPOTAMUS (*Hippopotamus amphibius*)—Plate 25, fig. 81—is an animal which has always been regarded with considerable interest, although its uses to man are not of the highest order. It is familiarly known as the River-horse; and is the *Barnick* of the Nubians, the Sea-cow or *Zee-Koe* of the Cape Colonists, and the *Imfooboo* of the Caffres and Matabili; it is probably also the Behemoth of sacred history. A full-grown male Hippopotamus sometimes attains a length of nearly twelve feet, whilst the girth of its body measures scarcely less. The hide exhibits an inky-brown colour generally, being at the same time more or less tinged with a fleshy redness about the mouth and inferior parts. The latter tint is very marked in young individuals. The habits of this extraordinary creature have been studied from the earliest times, and almost every African traveller of modern date has contributed something to our knowledge of its powers. Burchell, Burckhardt, Harris, Smith, Cumming, Livingstone, Andersson and others, have witnessed its sportive wiles in the reedy streams of its native land; whilst at home naturalists have been amply rewarded by watching the behaviour of the two fine examples preserved in the Zoological Society's Gardens, Regent's Park. The Parisians enjoy a similar advantage at the Jardin des Plantes of the French capital, and they have even witnessed the birth of two young; but on both occasions the jealous mother sacrificed her much admired offspring! The first was born in May 1858, and its death resulted, perhaps, rather from accident than intention; for, we are informed, that after swimming about a while it attempted to get on dry ground; but the descent from the sleeping apartment into the bath not being sloped, it experienced some difficulty in raising itself from the water; and whilst the mother was engaged in assisting it to clamber up the steps, she bruised and otherwise injured the body to such an extent that the poor little creature died the same evening. The second juvenile behemoth perished from injuries inflicted by the mother some days after its birth. In the hope of rearing a young Hippopotamus in England, the Zoological Society has spared neither pains nor expense to render the pair in their menagerie comfortable in each other's society. It is satisfactory to observe that the favoured couple live amicably together; but whether it be owing to the chilling influences of our changeable climate, or to prudential motives resulting from hippopotamine reasonings, or to other circumstances which invalidate the procreative function—we believe we are correct in stating that no reciprocations of affection have yet appeared sufficiently demonstrative to afford a belief that the authorities in question are at present likely to be rewarded for their trouble. In the wild state these animals display extreme solicitude for their young, which they carry on their necks while in the water; and, as the calves cannot remain long submerged, the mother rises more frequently to the surface when her offspring is with her. Whilst tending her young the female cannot be carelessly approached, and she will vigorously defend her offspring. All who have read Dr. Livingstone's "Travels" will remember the partial capsize and wetting he and his Makololo companions sustained from the infuriated rush of a female Hippopotamus, "whose young one had been speared the day before." Mr. Andersson and Captain Owen record similar catastrophes. The former says—"An immense Hippopotamus, with its calf, rushed out from amongst the reeds where she had been concealed, and, passing under our raft, almost immediately afterwards made her appearance on the surface of the water. Upon seeing this, I lost no time in firing; but, though to all appearance mortally wounded, we lost sight of her at the time. A few minutes afterwards, however, on coming to a bend of the river, we fell in with the canoe that had been sent on bottom upwards; and found, to our great consternation, that the wounded beast in going down the stream had caught sight of the canoe, and, instantly attacking it, had with one blow of her head capsized it. The men saved themselves by swimming; but all the loose articles were either lost or spoiled by the water." In the instance mentioned by Captain Owen, the boat was completely smashed, and sank; but, as in Dr. Livingstone's case, being close to the shore, all succeeded in landing safely. The Hippopotamus is nocturnal and gregarious in its habits. Large herds, to the number of thirty or forty and upwards, are frequently seen at one spot, some snoozing on the bank, and others noiselessly gliding through the limpid waters. They love a still reach of the stream, "and prefer to remain by day in a drowsy, yawning state; and though their eyes are open they take little notice of things at a distance." Dr. Livingstone adds, that "the males utter a loud succession of snorting grunts, which may be heard a mile off." Among the various modes of destroying this persecuted animal, that of shooting them is of course the most effective; nevertheless, the sport is attended with much difficulty, as, when in the water, they are only vulnerable immediately behind the ear. Like the Egyptians of old, the present native Beyeye employ the harpoon, and our unhappy behemoth is drawn out of the water in all the agonies of a helpless resistance. On land the harpoon is also employed as the principal part of a trap called the "downfall." The instrument, loaded with heavy weights, is suspended from the bough of a tree, and is in connection with a string below, which being touched by the beast causes the weapon to descend on its luckless pate. The Hippopotamus is also taken in pitfalls. Its flesh is palatable, and very highly esteemed. The hide is extensively employed in the manufacture of whips or sjamboks; whilst the canine teeth are especially valuable for making artificial teeth, the ivory fetching as much as thirty shillings per pound. For these reasons, multitudes of hippopotamuses are destroyed annually.

Some naturalists believe that a smaller kind of hippopotamus found in certain parts of Western Africa ought to be regarded as a distinct species. This form was first described by Dr. Morton under the title of *Hippopotamus minor*, and subsequently as *Hippopotamus liberiensis*. One of its distinguishing peculiarities consists in the presence of only two incisor teeth in the lower jaw. Dr. Leidy has given a minute description of its osteological characters in the second volume of the *Journal of the Academy of Natural Sciences of Philadelphia*. It has even been regarded as the type of a new genus.

FAMILY IV.—TAPIRIDÆ.

In their general appearance the Tapirs manifestly approach the pigs, whilst in respect of conformity to type, their considerable bulk, associated with a proboscidiform muzzle and more exalted stature, retain a cogency of development sufficient to indicate their transitional character. If the skull of an American Tapir be examined, its form will be seen to represent a pyramid having three facets, whereas that of the hog has four. A more significant feature, however, obtains in the elevated and arched character of the nasal bones, and in the lofty interparietal ridge surmounting the vertex of the cranium (fig. 71). The jaws are furnished with forty-two teeth; that is to say, twelve incisors equally divided above and below, four canines, and twenty-six molars, of which latter, seven occur on either side in the upper series. A wide interval separates the canines from the premolars. The spinal column possesses only four lumbar vertebræ; but there are twenty pair of ribs. The bladebone of the shoulder exhibits a deep circular notch at its anterior margin; the homologically corresponding bone of the hip, or ilium, being T-shaped. The anterior limbs are furnished with four digits; but the hind feet are tridactylous. The fossil genus *Palæotherium* has three toes on all the feet. The Tapirs are found inhabiting the reedy forests of tropical Asia and America, where they feed on grass and herbage.

Fig. 71.



Skull of the Tapir.

THE COMMON TAPIR (*Tapirus Americanus*)—Plate 25, fig. 82—is a native of South America, and, though found in all parts of the continent, from the Straits of Magellan to the Isthmus of Darien, is more particularly abundant on the east coast of the continent. It stands rather high on the legs, and frequently attains a length of six feet from the extremity of the proboscidiform muzzle to the root of the tail. The hide has a deep-brown colour approaching to black, being scantily furnished with short hairs closely applied to the surface of the skin. The ears are of moderate size, the eyes small, and the muzzle extremely attenuated and prolonged into a proboscis, which is naked and flesh-coloured at the tip. The neck is surmounted by a short, bristly, black mane. The tail is insignificant. The Common Tapir is monogamous and nocturnal in its habits. Selecting the deepest recesses of the forest, it snoozes lazily during the day, and when the shades of evening gather darkness, it wanders forth to commit its nocturnal depredations along the grassy and luxurious slopes of a neighbouring stream. Herbs ot every sort seem to be devoured without much selective care; and, swinelike, it occasionally swallows putrid vegetable matters, as well as all kinds of garbage. A tame specimen in the possession of D'Azara broke open and demolished the contents of a silver snuff-box! Even in the wild state, their stomachs have been found to contain various earthy products, besides pieces of wood and pebbles. The Tapir is possessed of very considerable strength; it naturally exhibits a mild disposition, but when attacked offers a stout resistance. It is easily domesticated. The flesh is coarse and insipid.

ROULIN'S TAPIR (*Tapirus villosus*) is also an inhabitant of South America. It is found, however, on mountainous slopes upwards of four thousand feet above the level of the sea. In some respects it is said to approach more closely to the Malayan species. The hide is of a dark black colour, and thickly clothed with hair. The nasal bones are more elongated than in other existing species—constituting a feature which occurs more markedly in the extinct genus above mentioned.

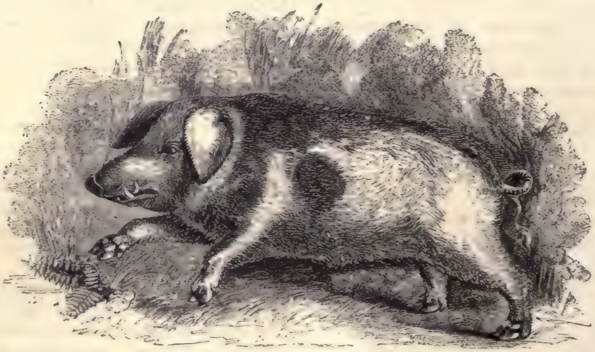
THE MALAYAN TAPIR (*Tapirus Malayanus*) or BABI ALU, is a native of Sumatra, Borneo, and the Malaccas. It is a comparatively rare and unknown animal, and was first introduced to our notice by Major Farquhar in 1816. Subsequently Sir T. Stamford Raffles communicated a more detailed account of this animal, which was published in the thirteenth volume of the Linnæan Society's Transactions for 1821. He writes as follows—"The Malay Tapir resembles in form the American, and has a similar flexible proboscis, which is six or eight inches in length. Its general appearance is heavy and massive, somewhat resembling the hog. The eyes are small. The ears are rounded and bordered with white. The skin is thick and firm, thinly covered with short hair. There is no mane on the neck, as in the American species. The tail is very short, and almost destitute of hair. The legs are short and stout, the fore-feet furnished with four toes, the hind feet with three." The most characteristic feature, however, has reference to the colour of the hide; which has a deep glossy black hue generally, but is white on the rump, back, and sides of the belly, the line of demarcation being clearly defined. In the young state it is for the first three or four months more uniformly blackish above and white underneath, being at the same time "beautifully marked with spots and stripes of a fawn colour." The young specimen domesticated by Mr. Farquhar became so exceedingly familiar, that it was wont to feed, like a petted dog, on bread, cake, and all kinds of vegetables. A full-grown female measures upwards of eight feet from the tip of the nose to the base of the tail. The male is somewhat smaller.

FAMILY V.—SUIDÆ.

The various members of this family are familiarly known as swine, and are with few exceptions characterized by the possession of four toes on each foot, the anterior digits being furnished with strong hoofs; while the posterior pair, which barely reach the ground, are likewise ungulated (Plate 33, fig. 108). The number of teeth varies; but the canines of the male are usually more or less conspicuous externally. The head is prolonged in front into a mobile truncate, snout. The tail, on the other hand, is short, or only rudimentary. The skull presents the form of a quadrangular pyramid, whose apex is represented by the extended muzzle. In the wild state swine are mostly found in low marshy forests.

THE WILD BOAR (*Sus Scrofa*) is the progenitor of all our common swine; in form and general appearance it does not differ very materially from our domestic hog (fig. 72), which has the skull rather more elevated. When provided with its full complement of teeth there are twelve incisors, equally divided above and below; four exserted, prism-shaped, recurved canines, and twenty-eight molars—in all, forty-four. The premolars are more or less compressed; the posterior grinders being tuberculated. The Wild Boar is an inhabitant of the forests of Asia and Europe generally; and although no longer known in this country, it was formerly found in Great Britain, and probably also in Sweden and Denmark. It is an exceedingly fierce and vindictive animal, capable of inflicting severe wounds on its enemies—be they men, horses, or tigers. It is doubtful whether the hunter experiences so much danger in pursuing the larger Carnivora as he does in chasing the wild hog. In India, however, this sport is much in vogue, and attended with varied excitement. During the hunt, "it is extremely common to see a party divide after various hogs, either started at the first from the same cover, or roused in the progress of chasing a single one. Where it is known that two or more are in the bund, cane, &c., which is beating, a portion of the horsemen follow the horse that starts, leaving their comrades to manage the remainder. Nothing can exceed the interest created when, as sometimes occurs, two or three parties are following each their respective game. Some may be seen spurring on with the utmost energy; others pulling hard to restrain their frightened or too impetuous steeds; perhaps one or more in different stages of falling; others stopping to dismount and recover spears which had missed their object; and eventually a successful Nimrod triumphing over his fallen victim." Captain Williamson also adds, that "hunted hogs, and indeed sometimes as a matter of caprice those not disturbed, will attack any object they may chance to see, such as peasants, cattle, &c. They

Fig. 72.



The Tame Boar (Sus Scrofa).

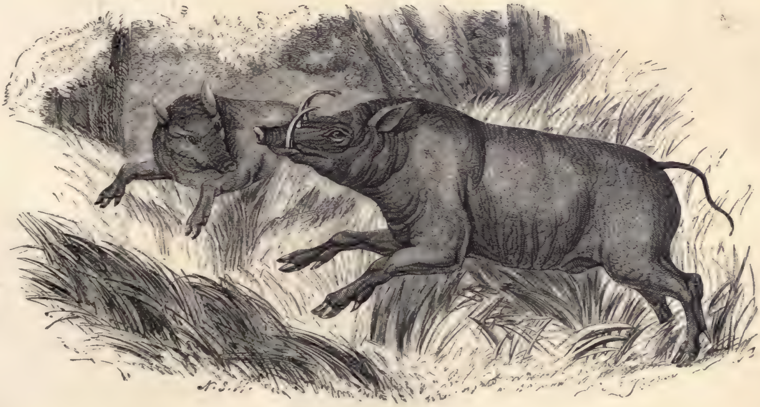
are greatly attracted thereto by any attempt which is made to escape from them. Such as trust to their speed are for the most part soon overtaken, and receive a cut of the tusk in each thigh, the boar putting his nose between their knees, and giving them a violent toss!" For the greater part of the year the boar is found alone, but during the spring hunters often come upon a pair and their litter. At such times the sow offers no inconsiderable resistance, and frequently punishes her enemies with a remarkably severe bite. One which attacked Captain Williamson seized him by the foot, which, on being suddenly withdrawn by the hunter, left part of the boot in her mouth! During the season of love, the boars display towards each other the most ungovernable animosity. The period of gestation extends over a space of one hundred and twenty days, the domestic sow producing from ten to fourteen pigs at a single litter. The voracity and destructive habits of the hog are too well known to require description. According to Vander Hoeven, single-hoofed varieties exist in the neighbourhood of Upsal, and also, it is stated, in some parts of Hungary. Into the merits of pork we do not enter; nevertheless it is fortunate that multitudes of people enjoy a food which is so easily accessible. As to its ancient prohibition in the East, one might almost be inclined to believe that it was originally forbidden on account of the pig's liability to be infested with young cystic larvæ or *scolices* of the common tape worm found in man; and yet it is perhaps necessary that the *Tænia solium* should dwell in its human host; and therefore meazled pork is occasionally eaten! We cannot here further discuss this curious question.

THE MASKED BOAR (*Sus larvatus*), or BOSCH-VARK is an inhabitant of the plains and forests of South-eastern Africa, the Cape, and the island of Madagascar. It is a large animal, between five and six feet long, and standing about two feet four inches in height at the shoulder, presenting a truly formidable appearance. Its hideousness is much increased by the presence of two nipple-like warty excrescences on either side of the muzzle near the tusks; these are supported on bony protuberances. The canines are large; the superior pair projecting horizontally. The hide exhibits a dirty brown colour, and is furnished with bristles which have a more marked development on the neck and back. The tail is about a foot long and tufted at the extremity.

THE PAPUAN BOAR (*Sus Papuensis*), or BENE, is a smaller species, scarcely exceeding half the length of the preceding, and of a much more slender build. It is tolerably abundant in the forests of New Guinea. The superior canines are comparatively feeble, resembling the incisors. The hide is clothed with short, stoutish bristles, which are ringed with black and white, the skin of the young pig is brown, the back being marked by five yellowish bands. In the young state these animals are captured and reared by the natives for food; the pork being highly esteemed, not only by themselves, but by European colonists also.

THE BABYROUSSA (*Babirussa alfurus*) is an inhabitant of Celebes, Bourou, and other easterly islands of the Indian Archipelago. By the natives it is absurdly called the stag-hog, from its standing rather high upon its legs; and the erroneous figure given by Piso in his edition of the "Natural History of East India," by Bontius, is calculated to give force to this palpable misnomer. The jaws are furnished with thirty-two teeth; that is, eight incisors, four canines, and twenty molars. The canines of the upper jaw are enormously enlarged in the male; and, ascending from their sockets, which are also directed upwards, they arch over the face, their crowns being directed backwards and downwards. The corresponding tusks of the lower jaw are also very conspicuously developed (fig. 73). The canines are not enlarged in the female, and she exhibits a more

Fig. 73.



The Babyroussa (Babirussa alfurus).

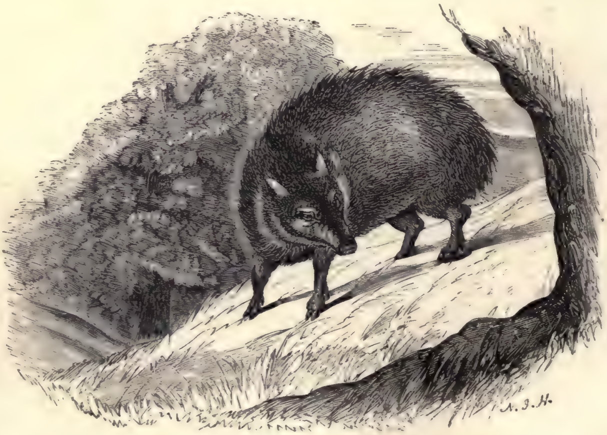
slender build generally. So far as we are aware, the use of the large tusks in the male have not been satisfactorily explained. Those of the lower jaw are doubtless intended as defensive and offensive weapons; but as the superior pair often recurve sufficiently to touch the forehead, they cannot prove very formidable instruments of attack. It seems scarcely enough to say that they are designed to protect the eyes from injury during the animal's progress through thick bushes; and there seems more aptness in the old notion that they are employed to support the head by suspension to a bough, whilst the animal is sleeping in the standing posture. This idea, however, rests more upon theory than upon observation.

THE ÆTHIOPIAN WART-HOG (*Phacochærus Æthiopicus*) AFRICAN BOAR, INGOOLOOB, or VALKE-VARK, is an inhabitant of the Cape of Good Hope. In common with its congeners, it is characterized by the possession of a large skull, furnished with frightful-looking tusks; those of the upper jaw are enormously developed. The teeth vary in number, the incisors being usually absent in this species. The canines are directed upwards and outwards. The molars of the permanent series are twenty in number; that is, five on either side above and below; but twelve of these become deciduous, so that in the old animal only eight may be present. The last grinder is remarkably elongated, and consists of numerous cylindrical tubes of dentine and enamel, cemented together. The Wart-hogs are provided with thick, fleshy, wen-like lobes on the cheeks, which, associated with the prominent warty excrescences below the small, sinister-looking eyes, impart additional hideousness to these animals. The Valke-vark is about two feet six inches high at the shoulder, and nearly five feet in length. The hide exhibits a reddish-brown colour; the upper parts being clothed with long stiff bristles—those on the crown of the head radiating, as it were, from a common centre. The muzzle is broad and truncated abruptly. The tail is about twenty inches long, very narrow, and tufted at the extremity. The Valke-vark is gregarious in its habits.

ÆLIAN'S WART-HOG (*Phacochærus Æliani*) enjoys a more extensive area of distribution over the African continent than the above; examples having been procured from Cape Verd, New Guinea, Abyssinia, and the Mozambique. It is also called the *Haruja*, or *Hallup*, and is readily distinguished from the foregoing by the presence of incisor teeth in both jaws, of which there are generally two above and six below; the bones of the forehead being also slightly depressed in this animal, but convex in the valke-vark. The hide exhibits an earth-brown colour, and is sparsely clothed with bristly hairs, except along the central line of the neck and back, where they form a well-developed mane, whose individual bristles are eight or nine inches in length. A single hair bulb commonly gives origin to several bristles. The tail is nearly naked, but tufted at the tip, as in the above. Both species live upon roots and bulbs which they grub up with their powerful tusks, aided by a kneeling posture to facilitate the wedge and lever-action of the snout.

THE COLLARED PECCARY (*Dicotyles torquatus*), or TAJAZOU, is a small kind of hog, living in Mexico and the southern districts of the United States, being at the same time more extensively dispersed over the continent of South America. The members of this genus differ from ordinary pigs in several interesting particulars:—Firstly, the hind feet are tridactylous; the outer toes being absent. Secondly, the metacarpal and metatarsal bones of the large anterior digits are closely united. Thirdly, the canine teeth, though well developed, do not project from the mouth externally. Fourthly, the loins support a peculiar gland which exhales a fetid odour. Fifthly, there is no tail; its place being occupied by a slight prominence or

Fig. 74.



The Collared Peccary (Dicotyles torquatus).

tubercle. Some other minor peculiarities exist; and Cuvier mentions that the aorta, or principal arterial trunk of the body, is very commonly enlarged or aneurismal at different parts of its course. This, however, is clearly an abnormal state, for which it is not easy to account, unless, as in the similar case of the ass, it be owing to the presence of parasites in the blood of the kind, belonging to the genus of Entozoa called *Strongylus*. The habits of the Collared Peccary are similar to those of swine in general; its food consisting of roots, bulbs, acorns, and other fruits, earthworms, grubs, and insect larvæ of all kinds, found in or upon the damp marshy soils, where this animal delights to wallow. Although the Tajazou has been domesticated, its flesh is not sufficiently soft and palatable to be employed as a substitute for common pork; and were it more pleasant it could scarcely supplant the ordinary hog, as the female only produces two young at a birth, and a full-grown individual seldom exceeds fifty lbs. in weight.

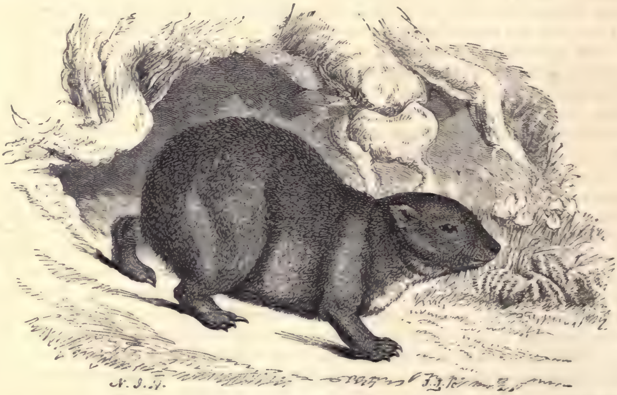
THE WHITE LIPPED PECCARY (*Dicotyles labiatus*), or TAGNICATE, is a larger species, weighing almost double that of the Tajazou, with which, however, it was formerly confounded. It is readily distinguished by the pale colour of the lips, the rest of the hide being brown as usual; it is also of a stouter build, the snout being likewise more prolonged and expanded at the tip. For an interesting account of the habits of this animal we are indebted to Mr. Bennett, who observes that the White-lipped Peccaries, unlike the former, "congregate in numerous bands, sometimes amounting, it is said, to more than a thousand individuals of all ages. Thus united, they frequently traverse extensive districts; the whole troop occupying an extent of a league in length, and directed in their march, if the accounts of the natives are to be credited, by a leader who takes his station at the head of the foremost rank. Should they be impeded in their progress by a river, the chief stops for a moment, then plunges boldly into the stream, and is followed by all the rest of the troop. The breadth of the river and the rapidity of the current appear to be but trifling obstacles in their way, and to be overcome with the greatest facility. On reaching the opposite bank, they proceed directly on their course, and continue their march even through the plantations which, unfortunately for the owners, may happen to lie in their way, and which they sometimes completely devastate by rooting in the ground for their favourite food, or devouring such fruit as they find there. If they meet anything unusual in their way, they make a terrific clattering with their teeth, and stop and examine the object of their alarm. When they have ascertained that there is no danger, they continue their route without further delay; but if a huntsman should venture to attack them, when they are thus assembled in large numbers, he is sure to be surrounded by multitudes, and torn to pieces by their tusks, if he is so unwise as to neglect his only chance of escape, which consists in climbing a tree, and thus getting fairly out of their reach. The smaller bands are by no means equally courageous, and always take to flight at the first attack." The White-lipped Peccary appears to belong exclusively to South America, being very abundant in the provinces of Guiana and Paraguay.

FAMILY VI.—HYRACIDÆ.

The group of small quadrupeds associated under the above title, constitute a distinct family, the members of which, though insignificant in respect of bulk and numbers, nevertheless possess a special claim upon the attention of the scientific naturalist. By those who have not studied the subject, it will hardly be credited that these little animals, formerly classed with the Rodents on account of their marked resemblance to that family, present a close approximation to the pachyderms, and more particularly to the rhinoceroses. This alliance, however, is very obvious, when we examine the condition and characters of the feet and teeth—as was, in the first instance, pointed out by Baron Cuvier, and subsequently insisted on by Wiedemann, Swainson, Lesson, Gray, and others. Regarding only the anatomical peculiarities, it would be more correct to place this family between the Tapiridæ and Rhinoceridæ; but as its external features present so marked a deviation from those of the two families just mentioned, we prefer to consider this aberrant group in the present position—as furthest removed from the ordinary pachydermal type. The Hyracidæ are furnished with thirty-eight or forty teeth, namely, six incisors, two above and four below, and twenty-four or twenty-eight molars. In the latter case, there are no less than sixteen premolars or spurious grinders—the canines being always absent. The incisors do not exhibit a true rodent structure, but are conical and similar to those of the hippopotamus. The molars, on the other hand, are very like those of the rhinoceros; the crowns of the upper set being distinguished by two enamelled eminences, and connected by a ridge to the outer margin, whilst those below display two semicircular ridges, whose convexity is directed outwards. The anterior limbs are furnished with four toes, but the hind feet are tridactylous. The digits are provided with small flat hoofs; a remarkable exception obtaining to the inner toes of the hind feet, which terminate in curved and sharply-pointed claws. Both as regards the skeleton and viscera, we find many other modifications of structure more or less conformable with the true pachydermal type, amongst which may be specially mentioned the existence of no less than twenty-one pairs of ribs—a number far exceeding that of any rodent, and giving a pair more than is found either in the proboscidean tapirs or elephants. In the skull the malar bone forms a complete orbital ring. The Hyracidæ are also provided with a double cœcum; and this, strangely enough, according to Professor Owen, indicates an affinity to the sloths: which edentate group, we may mention, contains an animal—the Unau—possessing a still larger number of ribs, namely, twenty-three pairs. On this subject Professor Owen, without referring to the ribs, and merely reflecting on the fact which an examination of the cœcum had suggested to his mind, very pithily remarks:—"It is interesting to find, that while the facies of Hyrax so far simulates that of a rodent as to have deceived the older naturalists, and to have concealed from them those unerring indications of its alliance with the Pachydermata which the osseous system exhibits; yet that nature, as if in confirmation of her abhorrence to the saltus, had left in the internal structure of this singular animal an impression borrowed from the type of the Edentata." However agreeable to our taste, we cannot pursue the subject further, and have only by way of conclusion to observe, that the skin is thickly clothed with hair, the face being well supplied with stoutish bristles on the muzzle and immediately above the eyes; similar thick hairs are also here and there interspersed throughout the fur at different parts of the body. The ears of Hyracidæ are short; the tail being represented externally by a mere tubercle. Herbage and various kinds of grass constitute their food.

THE DASSE (*Hyrax capensis*), KLIPDAS or CAPE HYRAX, is an inhabitant of the mountainous districts of Southern Africa generally, both inland and along the coast. It is about the size of a rabbit, and conceals itself in the holes and crevices of rocks (fig. 75). It lives in colonies, and feeds upon grasses, aromatic herbs, and the young twigs of bushy shrubs. Should any enemy approach while the colony are basking in the sun, as they are frequently wont to do, an alarm is immediately sounded by their sentinel, and away they all scamper to their hiding-places; the warning cry being peculiarly shrill and prolonged. The Dasse is readily tamed, and, according to Mr. Rudston Read, two examples kept by a friend of his became very agreeable companions. "They would find him out," he says, "when lying on the sofa or in bed, and, climbing up, shelter themselves on his breast within his waistcoat, or creep under the bed-clothes at his back, and, lying quiet, enjoy the warmth." Another one, "when allowed to run unconfined about the room, was inclined to be sociable, but was restless and inquisitive, climbing up and examining every person in the cabin, and startling at any noise, which caused it instantly to run and hide itself. But, from confinement, it became savage and snarling, and tried to bite when anything was put near its cage. Both wild and in restraint it is remarkably clean in its habits, always frequenting and depositing its dung in one place. From its faintly crying in its sleep we may conclude that it dreams. have also heard it," adds Mr. Read, "chewing its food by night when everything has been quiet. In its food it was pleased with variety, eating first a few leaves of one plant and then of another, and greedily licking salt when given to it. In its passage home its food was Indian corn bruised, bread, raw potato, and onion, with a small quantity of water, which, in drinking, it partly lapped and partly sucked up. It was very sensible of cold; for when a candle was placed near the bars of its cage, it readily acknowledged the little warmth given out by turning its side, and sitting still to receive the full benefit of the rays of heat. I am inclined to think that the female does not produce more than two young ones at a time, from having observed, in several instances, but two following the old ones." The flesh of the Cape Hyrax is stated to be excellent eating.

Fig. 75.



The Cape Hyrax (Hyrax capensis).

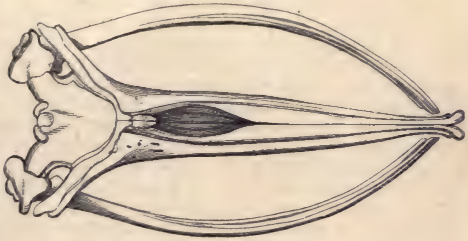
THE DAMAN (*Hyrax Siriacus*), or SYRIAN HYRAX, is a distinct species, but appears to be identical with the Abyssinian form described by Ehrenberg as the *Hyrax Abyssinicus*, under which title it is also entered in the catalogue of Mammalia preserved in the British Museum. It is a native of Palestine and the mountainous borders of the Red Sea generally; it is believed to be the Shaphan of scripture history. The body is about twelve inches long, possessing a similar measurement in height. The fur exhibits a greyish-brown colour above, being fulvous at the sides, and whitish underneath; the individual hairs are annulated by these several shades; their relative amount varying according to the region of the body in which they occur. The Damans are gregarious, selecting for their habitations those inaccessible caverns and clefts, which the rocks of Syria so abundantly afford. Like the Cape Hyrax, they delight to bask in the sun near their snug retreats, exhibiting the same natural caution and timidity. The conies are, as Solomon aptly expresses it, a "feeble folk," although they have "their dwellings in the rocks."

Two or three more species have been described. Of these may be mentioned, Smith's Hyrax (*Hyrax arboreus*) from South Africa; this form possessing arboreal habits, and being distinguished by its longer fur, which also displays a white spot on the back. Another species, capable of climbing trees and feeding on their fruits, is the *Hyrax Sylvestris* of Temminck. This form inhabits New Guinea and other parts on the west coast of Africa, and it is remarkable as possessing only twenty-four grinding teeth; that is, three premolars and three true molars on each side of either jaw, the orbital ring being at the same time more complete than obtains in any other member of the family.

ORDER XII.—CETACEA.

ALTHOUGH scientific naturalists have uniformly insisted on the mammiferous character of the cetacea—at least since the days of Cuvier, and also, in some degree, from the time of Linnæus—the majority of people still class them with fishes; but the only grounds on which these animals can with any propriety be said to resemble the finny tribe, are those which refer to their form and the conversion of the anterior limbs into finlike paddles. Even here, however, a close inspection of the leathery hide, of the modified limbs, and of the horizontal tail, is sufficient to indicate a wide departure from the fishes properly so called, in which the tail is vertical, the fins composed of numerous rays, and the integuments more or less converted into separable scales; and what is still more distinctive, we also find conspicuous indications of the reproductive organs externally, as well as mammary glands in the female. Anatomical investigation has likewise shown that these gigantic denizens of the deep breathe by means of lungs, and that they have a pulmonic and systemic circulation, as obtains in other mammals. Taking the skeleton of the common Greenland whale—Plate 32, fig. 90—as a type of zoophagous cetacea, it is extremely interesting to observe how its several osseous elements have become modified in form, and altered in bulk, in order to meet the exigencies of a creature destined to live in a medium so different from that generally enjoyed by the mass of mammalian vertebrates. Commencing with the head, the first thing that strikes us is the remarkable extension of the bones of the face, the inter-maxillary and superior maxillary bones arching forwards to form a kind of rostrum, whilst the lateral divisions of the lower jaw converge towards the tip of the snout, forming a curve on either side scarcely less conspicuous. The cranial bones are not less altered; the nasals are short, the temporals square-shaped, the frontals remarkably narrowed and directed obliquely outwards and backwards, the vertex of the skull being almost entirely occupied by the upper flattened portion of the occipital bone. All these characters are well displayed in the accompanying woodcut (fig. 76). If our attention be next directed to the vertebral column, we find on the one hand an almost complete abrogation of the cervical region, and a striking augmentation of the caudal elements on the other; taken as a whole, however, the bone-chain is massive and well developed. The most interesting feature in connection with this part of the skeleton has reference to the vertebræ of the neck, which in all cases maintain their typical number, although, in the true whales, they are completely ossified together so as to form a single mass, more or less fissured by deep clefts, which serve to indicate the original existence of seven distinct vertebræ in the embryonic condition. But this is only true of the whalebone whales, for in other members of the order the several segments are more or less free; there being six anchylosed together in the spermaceti, and two only in the piked-whales, the dolphins, and the porpoises; in the latter the first and second vertebræ are conjoined; but in the Balanopteræ the union takes place between the second and third cervical segments. In the herbivorous cetacea all the bones are permanently free, and this is also the case in the sou-sou or dolphin of the Ganges. In regard to the dorsal and lumbar vertebræ, all that we need remark is, that both series vary in number, in different genera, while their spinous and transverse processes become more and more conspicuous as they approach the caudal series. One, two, or three vertebræ have been assigned to the sacral or pelvic region, but these do not differ in structure from the previous group; and but for the existence of rudimentary pelvic bones, it would be scarcely fair to say that any should be classed in this category. The vertebræ of the tail are extremely numerous, upwards of thirty being present in the Rorqual; structurally they vary quantitively and morphologically, gradually diminishing in bulk and complexity of outline from before backwards, until we ultimately find them reduced to a simple compressed nodule at the free extremity of the organ. Of the rudi-

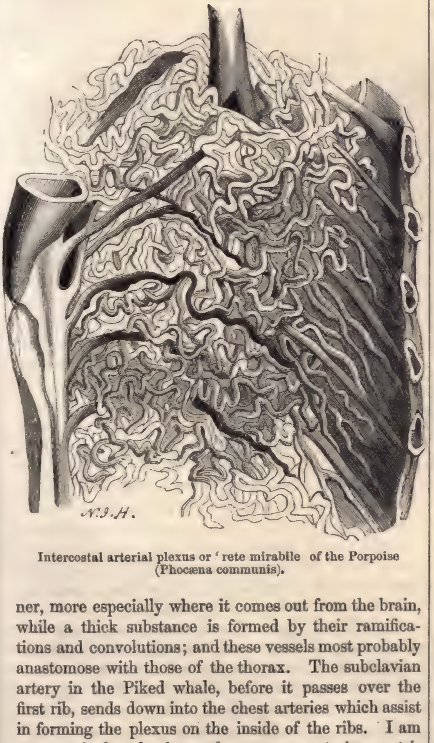
Fig. 76.



Skull of the Greenland Whale (Balæna Mysticetus), seen from above.

mentary character of the pelvic bones we have already spoken, their attenuated form bearing no resemblance to the ilia of those quadrupeds in which the posterior limbs are present. The ribs are chiefly noticeable in respect of their mode of articulation to the dorsal vertebræ and the great degree of curvature, which is necessary to make room for the bulky thoracic viscera; a few of the anterior ribs are articulated by their heads to the bodies of the vertebræ and by a tubercle to the transverse processes, but the remainder have only a single mode of connection and have no true articular facets at their attached ends. The paddles or anterior extremities are worthy of particular consideration. In them, as has been already hinted, are to be found evidences of conformity to type, having a significance not less forcible than that enunciated when treating of the bones of the neck. Viewing the limb from without, there is nothing to indicate the parts severally denominated arm, fore-arm, and shoulders; but upon dissection we find all the osseous elements ordinarily entering into the constitution of these segments fully represented and easily recognized. With the exception of the humero-scapulur articulation, all the bones are firmly invested and packed together by fibrous tissue, so as to prevent motion upon one another; and what is more noticeable, is, that they have all become shortened lengthwise, whilst their breadth has somewhat increased, as it were, by compression within the tightly investing teguments. In some species, as in the common mysticete, the digital phalanges are more numerous than usually obtains in the feet of pentadactyle quadrupeds. If we turn our attention to the skeleton of any of the herbivorous cetacea—such, for example, as that of the Dugong, Plate 34, fig. 109—not only do we observe a less considerable departure from the ordinary mammalian type, as instanced by a comparison of the bones of the hand, arm, fore-arm, and shoulder; but in contemplating the structure of the head and neck, it is evident that we have moved a step higher in the scale of organization. The seven cervical vertebræ are distinct, though still remarkably compressed from before backwards, and the skull, whilst visibly contracted in the same direction, presents, nevertheless, several peculiarities sufficiently cogent to demand special notice; these will be immediately considered when describing the general characteristics of the Manatidæ. Meanwhile we pass on to notice very briefly, some of the more striking modifications of the viscera, as well as other internal and external arrangements equally suggestive. And, firstly, as respects the organs of respiration—which are chiefly to be noted on account of their singular communication with the air by means of two nostrils situated at the top of the head in the true whales, and by a single opening similarly placed in the dolphins; in the herbivorous species these passages terminate in front of the muzzle, as in mammalia generally. Having, on several occasions, dissected the common porpoise with very great care, we are in a position to testify to the accuracy of Baron Cuvier's account of the singular manner in which the windpipe terminates, especially within a vertical extension of the pharynx, which is commonly designated the spouting apparatus, the external openings above being vulgarly called the blow-holes. "If we trace the œsophagus upwards," says Cuvier, "we find that when it arrives opposite the pharynx, it appears to divide into two passages, of which one is continued onwards to the mouth, while the other mounts to the nose; this latter passage being surrounded with mucous glands and fleshy muscular bundles. Some of these are longitudinal, arising from the circumference of the posterior orifice of the bony nostrils, and descending along that canal to the pharynx, and its lateral path. The others are annular and appear to be a continuation of the proper muscle of the pharynx, and as the larynx rises into this passage in the form of an obelisk or pyramid, these annular fibres have the power of grasping it by their contractions. Mucous follicles which empty their secretion by conspicuous excretive orifices are abundant at this part. The lining membrane of the nasal passage having reached the vomer, assumes a peculiar texture; becoming thin, smooth, very dry, of a black colour, and apparently destitute of nerves and vessels. The two osseous nasal canals are closed at the superior or external orifice by a fleshy valve in the form of two semicircles, attached to the anterior margin of that opening, which it closes by means of a very strong muscle lodged above the intermaxillary bones. In order to open it some foreign body must press against it from below. When this valve is closed, it cuts off all communication between the nasal passages and the cavities above them. These cavities consist of two large membranous pouches formed by a dark-coloured mucous skin, which is much wrinkled when they are empty; but assuming, when distended, an oval figure, which in the porpoise equals the size of a common wine-glass. These two pouches are lodged beneath the integuments, in front of the nostrils; they communicate with an intermediate space immediately above the nostrils, the latter opening externally by a transverse semilunar slip. Very strong muscular fibres form an expansion, which closes in the upper surface of this apparatus; these fibres radiate from the whole circumference of the cranium to unite above the two pouches, being adapted to compress them forcibly. Let us suppose the Cetacean has taken into its mouth some water which it wishes to eject; it moves the tongue and jaws as if about to swallow it; but closing the pharynx, the water is forced up into the nasal passages, where its progress is accelerated by annular fibres, until it raises the valve and distends the membranous pouches above. Once in these sacs, the water can be retained there until the animal wishes to spout. For that purpose, it closes the valve to prevent the descent of the water into the nasal passages, and it forcibly compresses the sacs by means of the muscular expansions which cover them; and the fluid, thus compelled to escape by the narrow crescentic aperture, is projected to a height corresponding to the force of the pressure." Intimately connected with respiration—or rather, we should say, with the power of remaining under water for a considerable length of time without respiring—we find a special reservoir for arterialized blood; not formed however, by any unusual enlargement of the arterial trunks, but by a remarkable extension of certain small arteries which are twisted upon themselves in various directions. Often have we gazed upon this *rete mirabile*, as it is called, with astonishment; and although it has been figured by several authors, and especially by Breschet, from whose memoir the annexed cut is given, none of these representations fully portray the singularly complicated appearance produced by these vascular tortuosities (fig. 77). This structure was first accurately described and explained by the celebrated John Hunter, who observes that "the intercostal arteries divide into a vast number of branches, which run in a serpentine course between the pleura, ribs, and their muscles, making a thick substance, somewhat similar to the spermatic artery in the bull. These vessels everywhere lining the sides of the thorax, pass in between the ribs near their articulation, and also behind the ligamentous attachment of the ribs, and anastomose with each other. The medulla spinalis is surrounded with a network of arteries in the same manner, more especially where it comes out from the brain, while a thick substance is formed by their ramifications and convolutions; and these vessels most probably anastomose with those of the thorax. The subclavian artery in the Piked whale, before it passes over the first rib, sends down into the chest arteries which assist in forming the plexus on the inside of the ribs. I am not certain but the internal mammary arteries contribute to form the anterior part of this plexus. The motion of the blood in such cases must be very slow." He also adds:—"The descending aorta sends off the intercostals which are very large, and gives branches to this plexus; and when it has reached the abdomen, it sends off, as in the quadruped, the different branches to the viscera and the lumbar arteries, which are likewise very large, for the supply of that vast mass of muscles which moves the tail." As regards the function of this vascular apparatus, it is evidently connected with the power which whales have of remaining under water for a long period without coming to the surface, some species having been known, when harpooned, to be submerged for an hour and a half at a time. Co-ordinating with the habits of these animals, we also find peculiar modifications of the digestive organs. In the true whales, numerous plates of baleen are developed from the upper jaw. These laminæ of horny substance, or whalebone, as it is commonly termed, are essentially developments of the cuticular layer of the skin. As their special function is to entangle within their layers various medusæ and small molluscous animals, the lower or depending end of each plate is split up into a multitude of fibres, which, acting like a sieve, render their chance of escape the more hopeless; upwards of three hundred such baleen plates occurring on either side of the upper jaw in the common mysticete. The throat of the whale is comparatively small, and consequently adapted only for the passage of minute animals; in order, therefore, to obtain sufficient food to nourish its bulky frame, it is evident that millions of creatures must be hourly swallowed. The whale having come upon a swarm of molluscs, or pteropods such as the little *Clio borealis*, multitudes are immediately entangled in the baleen; and when a sufficient number have accumulated, the enormous tongue is raised forwards and upwards, and thus by one fell swoop of this organ, the unsuspecting mass are hurled backwards towards the gullet, the water strained from them at the same time escaping upwards through the blow-hole in the form of a conspicuous *jet d'eau*. Although the full-grown mysticetes are supplied with these horny plates for the prehension of their peculiar food, it is not true to say that they have no teeth at any stage of their existence; for, in the fœtal condition, as the independent researches of Geoffroy St. Hilaire, Eschricht, and Goodsir have shown, and as we have had an opportunity of witnessing, the lower jaw is furnished with numerous distinct dental sacs, each of which contains the rudiments of a separate tooth. Here again, therefore, we observe a remarkable conformity to type, in the rudimental development of organs, which, as they can never be required in after life, are consequently never brought to a state of perfection! Consistently with other peculiarities of their organisation, the stomachs of the Cetacea are all more or less complicated. Differences of opinion exist as to the degree of complexity in various species, but on the whole they do not depart materially from that which has often been described, and which we have ourselves observed to obtain in the common porpoise. In this species—as also in the white whale, from which the annexed cut (fig. 78) is taken—the organ consists of four distinct cavities; but in respect of relative bulk and function, it cannot in any measure be said to correspond with the multiple stomach of the ruminating quadrupeds. These compartments communicate with each other continuously, and are not supplied with special reservoirs, reticulations, or laminæ, such as are observable in the ruminant

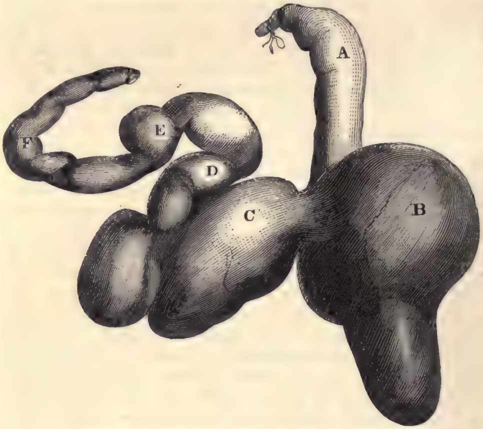
Fig. 77



Intercostal arterial plexus or rete mirabile of the Porpoise (Phocæna communis).

stomach, neither is there any inter-communicating channel common to the three first cavities, by which the aforesaid function could be maintained. In the accompanying figure A represents the œsophagus, B, C, D, and E the four stomachal compartments, F the duodenum. The only approach to any unusual extension of the internal secreting membrane, is such as is gained by the presence of numerous rugæ or foldings, which are more or less irregularly disposed throughout the entire compartments. Of the other circumstances in connection with the alimentary canal which call for particular attention, are those which refer to the great length of the intestinal tube, and to the presence or absence of a cœcum. Most of the spouting whales have no cœcum, but this appendage is present in the mysticete and in the piked whale. The chylopoietic viscera exhibit several peculiarities of form which need not be dwelt upon; but we may remark, in passing, the entire absence of any gall-bladder in the zoophagous species, whilst it is present in the herbivorous forms. The reproductive organs are largely developed, the mammæ of the female being placed in the inguinal region in the true whales and dolphins, and in the pectoral region in the phytophagous manatees and dugongs. The circulatory system has already, in part, engaged our attention, but the contemplation of such a marvellous machinery in these bulky creatures deserves some further comment. The amount of muscular pressure required to propel the life stream from the voluminous cavities of the heart of a rorqual is something well calculated to excite the astonishment of any one possessing the slightest acquaintance with the principles of hydraulic power. The main arterial trunk of the spermaceti whale has a circumferential measurement of at least three feet, "and when," says the illustrious John Hunter, "we consider these as applied to the circulation, and figure to ourselves that probably ten or fifteen gallons of blood are thrown out at one stroke, and move with an immense velocity through a tube of a foot diameter, the whole idea fills the mind with wonder." Generally speaking, the form of the heart is precisely similar to that of other mammals, but in the phytophagous dugong the apex of the heart is deeply cleft, so that the ventricles are partly detached from one another. In regard to the venous system, it should also be noted that its arrangements, in some parts, are even more plexiform than obtains in the arteries. This is particularly seen in the branches of the great anterior *vena cava*, and more especially in the veins which surround the spinal cord; whilst another still more interesting peculiarity connected with this system, is, that scarcely any of the veins are furnished with valves internally. All these conditions are admirably adapted to the suboceanic habits of the cetaceans, and taken in connection with other structures yet to be described, manifestly indicate evidences of harmonious design. We allude here principally to the character of the dermal and subcutaneous investment of the body. This consists essentially of the same elements which enter into the composition of the hide of ordinary quadrupeds; but nearly all trace of hares or bristles have disappeared in the zoophagous species, these structures being represented only in the embryonic condition of dolphins and in adult whales, by a few bristles attached to the anterior part of the upper or lower jaws. In some species the cuticle is rather thin, but in others it attains a remarkable development, and we have observed it to be upwards of an inch in thickness in the great rorqual. In like manner the corium acquires remarkable density and strength, passing gradually into a fatty tissue, which is commonly called the blubber, and which varies in quantity in different species, being in some found only a few inches thick, and in others surrounding the muscles to the depth of a foot and a half or even two feet below the cuticular surface. The larger kinds of whale are capable of yielding upwards of twenty tons of oil, and as the oil is worth about £30 per ton, the "whale fishery," as it is erroneously termed, proves a very lucrative trade. Upwards of twenty thousand tons are annually brought to this country by British whalers, notwithstanding the Americans and other nations have vastly increased the competition of late years. "In 1821," says the late Professor Edward Forbes, "the British whale fishery employed one hundred and fifty-nine ships, but the decline of the northern fisheries has reduced their number to the half. We are compensated for this, however, in the energy and success with which our Australian colonies are joining in the business; and the rich source of blubbery wealth which the north once was, the south now promises to be. At present we are beaten in whaling by our American cousins; but the great advantages presented by the proximity of Australia and the Auckland Isles to the southern whaling grounds, are giving us a fresh start, of which we will not be slow to avail ourselves. In 1844 the American whaling fleet numbered no fewer than

Fig. 78.



Compound stomach of the White Whale (Beluga Catodon).

six hundred and fifty vessels, tonnage two hundred thousand tons, and manned by seventeen thousand five hundred men. In 1848 the number was slightly under this estimate, though including one-tenth of the entire shipping of the United States. The social importance of this fishery will be at once appreciated, when it is stated that, about twenty years ago, it was estimated that as many as seventy thousand persons in the United States derived their chief employment and subsistence, in one way or another, from the whale fisheries; and the number so deeply interested in them must be even greater at present. Other countries, besides Britain and America, have but a small share of these profits: some sixty or seventy vessels from French, German, and Danish ports, make up the number of whalers. It must not be forgotten, however, that the indefatigable Hollanders had at one time a lion's share of the whole fishery to themselves—as long ago as 1680 there were fully two hundred and sixty ships, and fourteen thousand Dutchmen employed in the trade—nor that the first professional whalemen and original harpooners were Biscayans."

We have thus diverted somewhat from the immediate subject-matter of our description, in order to convey some adequate idea of the immense quantities of oil yielded by the Cetacea, which in proportion to the blubber itself, is as three to four. Most of the oil is derived from this source, but it should also be mentioned that the cellular tissue of the tongue and the interior of the large bones, especially those of the lower jaw, likewise contain a large quantity of oil. The fatty matter termed spermaceti, which is found only in a particular group of whales, is derived chiefly from the head of these animals. According to John Hunter, "the purest spermaceti is in the smallest and least ligamentous cells; it lies above the nostril, all along the upper part of the head, immediately under the skin and adipose membrane. These cells resemble those which contain the common fat in the other parts of the body nearest the skin. That which lies above the roof of the mouth, or between it and the nostril, is more intermixed with a ligamentous cellular membrane, and lies in chambers whose partitions are perpendicular. These chambers are smaller the nearer to the nose, becoming larger and larger towards the back part of the head, where the spermaceti is more pure. This spermaceti, when extracted cold, had a good deal the appearance of the internal structure of a water melon, and is found in rather solid lumps." Chemically speaking, it closely resembles the substance termed cholesterine, and like it, after being melted, concretes into thin crystalline laminæ of a silvery hue and peculiar greasy feel. In addition to these matters there is yet another substance found in the intestines of Cetacea, which, though not much sought after, is nevertheless of considerable value. This is ambergris. It is a concretionary formation, of a mottled, greyish colour; and when split open, it is found to contain a large number of the horny beak-like processes of cuttle-fishes, derived from the cephalopodous molluscs, on which the spermaceti whales delight to feed. It has a peculiar strong, diffusible odour, and when pure is soft and waxy on section; chemically speaking, it consists of a fatty substance or principle termed ambreine. Ambergris is used to impart an agreeable flavour to certain wines, and one or two grains, mixed and triturated with sugar, is sufficient to flavour a hogshead of claret.

The special organs of sense in Cetacea are constructed on the same plan as those of terrestrial quadrupeds, but, nevertheless, exhibit several peculiarities adapted to their aquatic habits. These are particularly noticeable in the organs of hearing and vision. Externally there is no auricular appendage, and the meatus auditorius is only represented by a very small aperture, scarcely large enough to admit the introduction of a small crow-quill. Internally, the essential part of the auditory apparatus, including the ossicles, are invested by an osseous framework distinct from the ordinary bones of the cranium which inclose the organs of hearing in other Mammalia. The osseous capsule consists of two distinct portions inclosing the labyrinth and tympanum. The tympanic bone is particularly hard, and very largely developed, having commonly a more or less kidney-shaped outline. This part is usually called the ear-bone, and owing to its density and power of resisting decay and disintegration, we find it very perfectly preserved in the tertiary marine deposits along the Suffolk coast, where multitudes of them are found associated with other water-worn osseous fragments in the phosphatic pseudo-coprolitic beds. Some specimens in our possession, evidently belonging to a species of porpoise, are very highly silicified, the petrous or labyrinthic bone remaining *in situ*, and displaying very clearly the spiral groove of the cochlea and the semicircular canals. As to the capacity of hearing enjoyed by Cetacea, much difference of opinion exists—the excellent authority, Scoresby, averring that they are not roused even by the report of a cannon; whilst others, who have also been engaged in whale-fishery expeditions, state that their powers both of hearing and vision are sufficiently acute to render the approach of the harpooners at all times difficult and sometimes unsuccessful. The eye is chiefly remarkable for the great thickness of its external or sclerotic coat, an arrangement calculated to maintain in its integrity the ellipsoid form of the crystalline lens and vitreous humour, which would otherwise yield to the pressure of the aqueous medium in which the animal swims. Ordinary whales have no true lachrymal glands, but these organs are present in the herbivorous cetacea, which latter are also furnished with a third eyelid or nictitating membrane. The brain of all the Cetacea is well formed, and provided with numerous convolutions. Though of large size in itself, it is remarkably small as compared with the bulk of the body, representing by weight in the common mysticete only the one three-thousandth part of the entire animal. The cerebellum is comparatively bulky; whilst, of the nerves which proceed from the base of the brain, the most remarkable are those which pass to the organ of hearing — their conspicuity being especially manifested in the dolphins.

FAMILY I.—BALÆNIDÆ.

This family consists of the true whales, which are distinguished from the cachalots, the dolphins, and the herbivorous cetacea, by the possession of plates of whalebone, or more properly baleen, depending from the palatal region of the upper jaw. They have no true teeth, although, as we have seen, there are tooth-sacs developed in the lower jaw of the embryonic mysticete. The true whales are further recognized by their preposterously large heads, which in some of the species extend to one-third of the entire length of the body. The nostrils are distinct and longitudinally disposed on the crown of the head. The mammary glands are placed in the inguinal region—an arrangement which also obtains in the cachalots and dolphins. The intestine is furnished with a cœcum.

THE MYSTICETE (*Balæna mysticetus*), or common Whalebone whale—Plate 28, fig. 89—is also known as the Greenland whale, and in Dr. Gray's catalogue of the Cetacea preserved in the British Museum it is called the Right whale—this term being also applied to the Cape whale (*Balæna australis*) by the South Sea whalers. Our best accounts of the Greenland whale are all more or less derived from the Rev. Dr. Scoresby's "Journal of a Voyage to the Northern Whale-fishery," and from a paper in the first volume of the Wernerian Society's Transactions, from which the following description is abridged. When full grown this species is from fifty to sixty-five feet in length, and from thirty to forty in circumference, immediately before the fins. It is thickest a little behind the fins, and from thence gradually tapers towards the tail, and slightly towards the neck. It is cylindrical from the neck, until near about the junction of the tail and the body, where it becomes ridged. The head has a triangular shape. The bones of the head are very porous, and full of a fine kind of oil. When the oil is drained out, the bone is so light as to swim in water. The jaw-bones are from twenty to twenty-five feet in length, and the space between them is about ten feet from side to side. The tongue is of great size, and yields upwards of a ton of oil; and the lips, which are placed at right angles to the flat part of the base of the head, yield fully double that amount. The palatal laminæ of baleen are not of equal length; neither are the largest exactly in the middle of the series, but somewhat nearer the throat; from this point they become gradually shorter each way. On each side of the mouth are about two hundred laminæ of whalebone. They are not perfectly flat; for, besides the longitudinal curvature, they are curved transversely. The largest laminæ are from ten to fourteen feet in length, very rarely fifteen feet. The breadth of the largest at the thick ends, or where they are attached to the jaw, is about a foot. The Greenland fishers estimate the size of the whale by the length of the whalebone; and when the baleen is six feet long, then the whale is said to be a *size fish*. In *suckers*, or young whales still under the protection of the mother, the whalebone is only a few inches long. It is immediately covered by the under lips, the edge of which, when the mouth is shut, overlap the upper part. The colour of the hide is black, grey, and white, with a tinge of yellow about the lower part of the head. The back, upper region of the head, most of the belly, the fins, tail, and part of the under jaw, are deep velvet-black. The anterior aspect of the lower jaw, and a portion of the abdomen are white; the narrow portion near the junction of the tail being greyish. The skin of suckers has a pale bluish tint. The cuticle or scarf-skin is only as thick as ordinary parchment, whilst the true skin is from three-fourths to an inch in thickness all over the body. The Greenland whale is not provided with a dorsal fin. The flippers, which are situated about two feet behind the angle of the jaws, measure nine feet in length, and rather more than half the same amount in breadth. The tail is compressed, semilunate, notched at the centre, and sometimes as much as twenty feet in breadth.

Notwithstanding the many exaggerated statements to the contrary, the Greenland whale seldom or ever exceeds fifty-eight or sixty feet in length. It is a slow swimmer, going at the rate of four miles an hour, though when harpooned, it is said to dive perpendicularly downwards at a speed of seven knots an hour. It occasionally ascends with sufficient force to throw itself entirely out of the water. It seldom remains submerged longer than twenty or thirty minutes, and when it rises again to the surface, it will remain there about the same time if not disturbed. In calm weather it is wont to sleep in this situation. One of the most moving and painful sights which can be imagined, is witnessed when the whale-fisher strikes a sucker, in order to secure its dam; whilst to say nothing of the unnecessary cruelty, it is more than probable that this inhuman practice entails serious injury to the fishery business, by greatly diminishing the chances of future success. According to the testimony of Scoresby, "the young is frequently struck for the sake of its mother, which will soon come up close by it, encourage it to swim off, assist it by taking it under its fin, and seldom deserts it while life remains. It is then very dangerous to approach, as she loses all regard for her own safety in anxiety for the preservation of her cub, dashing about most violently, and not dreading to rise even amidst the boats. Except, however, when the whale has young to protect, the male is in general more active and dangerous than the female." The period of gestation is believed to extend over a space of about ten months. In addition to its powerful and relentless human adversary, the Mysticete has to contend with other enemies, such as the shark, the thrasher, and the sword-fish. It is itself, however, a great destroyer of life; its principal food consisting of shoals of a small pteropodous mollusc, specifically known as the *Clio borealis*. Although the aperture of the throat is scarcely sufficient to admit the introduction of an ordinary hen's egg, yet to satisfy so prodigious a bulk of body, it is evident that myriads of these little creatures must go to form a single meal—and if so, what must be the annual consumption of this huge monster of the deep? Well may Mr. Darwin argue that for every animal which passes through a full cycle of its life, ten thousand perish ere they have reached maturity! Into details respecting the perils encountered by those embarked in the whale fishery, we cannot here enter. Full particulars are given in Dr. Scoresby's work. Let it suffice us to observe that between the years 1669 and 1778 the Dutch sent 14,167 ships to the shores of Greenland, and of these 561 were wrecked, no less than 73 having been lost in a single season.

The Greenland whale has occasionally strayed to the northern shores of Scotland and the Zetland Isles; those that have run aground being always found in a very impoverished condition. Even in this state, the monster was in olden times deemed a "Royal fish," and according to Pennant, or the still more authoritative Commentaries of Blackstone, when the whale was accidentally cast ashore the reigning monarchs divided the spoil—"the king asserting his right to the head, her majesty to the tail!"

Of other whales belonging to the genus Balæna, we have only space to particularize the following:—The western Australian whale (*B. marginata*) which is furnished with very long and slender baleen; the New Zealand whale, or Tuku Peru (*B. antarctica*) which attains a length of sixty feet; the Cape whale (*B. australis*) which is also an inhabitant of the southern ocean and of a uniformly deep black colour; the Japanese whale (*B. japonica*) which is very imperfectly known; and the Scrag whale (*E. gibbosa*) an Atlantic species, which is characterized by the possession of a series of knob-like protuberances along the middle line of the hinder region of the back, forming a sort of transition to the fin-backed whales. The genus *Megaptera* is, indeed, closely allied to the above species, and following the classification and nomenclature adopted by Dr. J. E. Gray in his synopsis of the cetacean families contained in the British Museum, we have further to indicate the principal members of the hump-backed genus, there specified, as follows:—Johnston's Hump-backed whale (*Megaptera longimana*) which is a common inhabitant of the northern seas—Dr. Johnston of Berwick described it from a specimen accidentally thrown ashore at Newcastle; the Bermuda Hump-back (*M. Americana*), whose head is covered with tubercles or nodulations, the hide being black above and whitish underneath; the Cape Hump-back or Poeskop (*M. Poeskop*); and the Kuzira (*M. Kuzira*), the latter being found off the coasts of Japan. The genus *Balænoptera* is represented by a single species commonly known as the Pike whale (*Balænoptera rostrata*). A great deal of confusion, however, still exists in reference to this species and until the points are more satisfactorily cleared up, we are scarcely in a position to describe it with confidence. According to Dr. Gray, it is identical with the *Rorqualus Boops* of *F. Cuvier*. It is an inhabitant of the northern seas, and has a black colour above, being reddish-white underneath the belly. A specimen is said to have been captured in the Thames near Deptford, but this example has been considered, by several authorities, only as a young example of the Great Northern Rorqual. Dr. Collingwood in his admirable little "Fauna of Blackheath and its vicinity," has recorded the circumstance as follows:—"On Sunday, October 23, 1842, a whale was observed in the Thames opposite Deptford Creek. Five men put off in a boat, and attacked it with a large bearded spear; and having pushed it immediately under Deptford Pier they overcame and despatched it. Having by mechanical appliances raised it upon the pier, its dimensions were ascertained to be—total length 14 feet 6 inches; length from nose to angle of mouth, 3 feet 10 inches; tail from fork to fork, 3 feet 10 inches. A full account of this whale is to be found in the *Zoologist* for 1842, with a figure; also an account of its capture, with a sketch of the animal, is to be seen in the *Illustrated London News*, vol. i. p. 388." Similar difficulties exist in regard to the determination of the specific characters of the Great Northern Rorqual of Dr. Knox, which, according to Dr. Gray, is identical with—

THE RAZOR-BACK (*Physalus Antiquorum*); and knowing the careful research which this eminent mammalogist has bestowed upon the subject, we shall assume his determinations in this respect to be correct. We have ourselves frequently examined the skeleton of Dr. Knox's celebrated specimen, so satisfactorily preserved and exhibited in the elephant-house of the Edinburgh Zoological Gardens, and we can therefore testify to the accuracy of the details given by the three eminent authorities on comparative anatomy who dissected it. Those who are interested in the details should consult Dr. Knox's original description published in the Transactions of the Royal Society of Edinburgh for 1827, or his more recent memoir—entitled "Contributions to the Anatomy and Natural History of the Cetacea"—recorded in the 3rd volume of the Journal of the Proceedings of the Linnæan Society. If Dr. Gray's views are right, it would appear that the whale taken at Black Gang Chine, Isle of Wight, in 1842, is also referable to this species; whilst the same may be said of specimens taken both at Berwick and at Plymouth in 1831. Another example was taken off the coast of Ostend in the early part of the present century, and the skeleton subsequently exhibited in London, near the King's Mews, Charing Cross. The hide of the Razor-back has a slatish-grey colour, being whitish underneath; the under border of the baleen, which is short, is blackish, the inner edge being pale-streaked. It is an inhabitant of the northern ocean. Respecting its habits, Mr. Bell remarks, that they "are different from those of the common whale. It is less quiet and tranquil in its general movements, seldom lying motionless on the surface of the water whilst blowing, but making way at the rate of about five miles an hour. When struck, the velocity of its descent is such as very frequently to break the line, of which Captain Scoresby mentions several instances." It is very doubtful if this species ever attains a length of upwards an hundred feet, though examples have been recorded which were only a few feet short of this measurement.

Dr. Gray has given the scientific appellation of *Physalus Boops* to a form which he considers quite distinct from the above, and which we may therefore more simply particularize as Gray's Fin-back whale. A specimen of this whale was captured off the Welsh coast in the year 1846, and it is now preserved in the British Museum under the above title. It is thirty-eight feet in length, has sixty vertebræ, and fifteen pairs of ribs. The head alone measures nine feet in length.

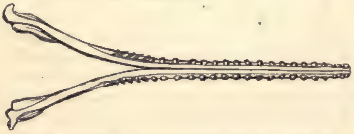
Several other species of the genus *Physalus* are indicated in the Museum catalogue.

FAMILY II.—CATODONTIDÆ.

The members of this family are sometimes described under the synonymous and equally distinctive title of Physeteridæ, which includes the cachalot or spermacetes, and the short-headed whales. These animals have the nostrils separate and longitudinally disposed; their palate is smooth and destitute of baleen; whilst a still more characteristic feature is seen in the presence of numerous large conical teeth in the lower jaw (fig. 79), the upper jaw being edentulous, or furnished with mere rudiments of teeth beneath the gums. The head, though comparatively short in some, is enormously developed. The intestine has no cœcum.

THE NORTHERN SPERM WHALE (*Catodon macrocephalus*), or COMMON CACHALOT—Plate 27, fig. 87—is also known as the Blunt-headed Cachalot, and the Spermaceti whale; generically, it is at once recognized by its elongated head, which is abruptly truncated anteriorly, the blowers being placed near the extremity of the snout, and the dorsal hump is rounded. In its native haunts, this huge monster is found in the northern seas, but it occasionally visits our own shores. An example was cast ashore on Cramond island, in the Frith of Forth, on the 22d of December, 1796; its length was fifty-four feet, and the greatest circumference, at a point immediately beyond the eyes, thirty feet; the upper jaw being ascertained to be five feet longer than the lower, which measured ten feet, and was provided with twenty-three teeth on either side. The largest tooth was eight inches long, its circumferential measurement being the same. It was described and accurately figured by Mr. James Robertson, in the 60th volume of the Philosophical Transactions. The occurrence of the Cachalot on the shores of the Orkney and Zetland islands is by no means a rare circumstance, but it is very seldom taken on the English coasts. That it does occasionally visit our shores, has been satisfactorily shown by Dr. Collingwood, to whom naturalists are indebted—to use his own words—for resuscitating "a still-born record of the Spermaceti whale," which he found in a document contained in Sir Joseph Banks' copy of the Philosophical Transactions in the British Museum. It is entitled an "Extract from a letter from Walberswick, on the coast of Suffolk, dated March 7, 1788," and runs as follows:—"A whale appearing on our coast is a rare phenomenon. The most extraordinary instance that ever happened of this sort was in February, 1763, after a hard gale of wind northerly, when no less than twelve whales, which undoubtedly came out of the Northern Ocean, were towed and driven on shore at the following places, all of them dead, and in a high state of putrefaction, excepting one." This notable exception was "one at Hope Point, in the River Thames. This was the only one seen alive. He ran aground and smothered himself in the mud, and was afterwards made a show of in the Greenland Docks. These were all of the spermaceti kind, and of the male gender;" "and it is remarkable," adds Dr. Collingwood, "that out of the twelve, (or rather ten, for two stranded on the Dutch coast,) six were found upon the coast of Kent. From an old engraving of the above specimen in my possession, to which a scale is attached, it appears to have been near sixty feet long. Within a much more recent period, a small Cachalot was captured in the Thames, near Gravesend, but I am not in possession of any particulars of the event." The Cachalot is gregarious in its habits, large multitudes of them herding together. By the South Sea whalers they are termed "schools;" sometimes all consisting of females, and at other of males not fully grown. One or two large "bulls," or "schoolmasters," as they are ridiculously termed, usually accompany the female herds, and Mr. Beale reckons that he has seen as many as six hundred individuals of the southern species in a single school! The female is comparatively small, and produces one, and sometimes two young, at a birth. The two recorded by M. F. Cuvier, which were brought forth by a whale stranded on the French coast, near D'Audierne, were each about ten feet in length. The young are of a deep black colour, and mottled with whitish spots.

Fig. 79



Jaw-bone of the Cachalot (Catodon macrocephalus).

THE SOUTHERN SPERM WHALE (*Catodon polycyphus*) very closely resembles the northern species, both in respect of its size and habits. It has the same large head and characteristic jaws, the lower being lodged in a groove of the upper, whilst the crowns of the teeth fit into corresponding socket-like cavities, so as to be entirely concealed when the mouth is closed. The southern Sperm whale, or Cachalot, occasionally attains a length of seventy or eighty feet, and a specimen has been minutely described by Mr. Beale which measured eighty-four feet. The skin is usually smooth and dark coloured, almost black; but piebald varieties occur, as well as other differences in the depth of shading. "Old bulls," says Mr. Beale in his work on the Sperm whale, "have generally a portion of grey on the nose, immediately above the fore-part of the upper jaw, when they are said to be grey-headed." The same authority observes that the head—which we stated in our introductory observations to contain a large quantity of oil—is "specifically lighter than any other part of the body, and will always have a tendency to rise at least so far above the surface as to elevate the nostril or blow-hole sufficiently for all purposes of respiration; and, more than this, a very slight effort on the part of the whale would only be necessary to raise the whole of the anterior flat surface of the nose out of the water. At very regular intervals of time, the snout emerges, and from the extremity of the nose the spout is thrown up, and at a distance appears thick, low, bushy, and white. It is formed of the expired air, forcibly ejected through the blow-hole, and acquires its white colour from minute particles of water previously lodged in the chink or fissure of the nostril, and also from the condensation of the aqueous vapour thrown off by the lungs. The spout is projected at an angle of 136°, in a slow and continuous manner, for about three minutes, and may be seen from the mast-head in favourable weather at the distance of four or five miles. When the whale is alarmed or "gallied," the spout is thrown much higher with great rapidity, and differs much from its usual appearance. Immediately after each spout the nose sinks beneath the water, scarcely a second intervening for the act of inspiration, which must consequently be performed very quickly, the air rushing into the chest with astonishing velocity. There is, however, no sound caused by inspiration, and very little by expiration, in this species; in short, nothing of that loud noise called the "draw-back" in the finback and other whales. Ten seconds is occupied by a large bull sperm whale in making one inspiration and one expiration; during six of these the nostril is beneath the water. At each breathing time the whale makes from sixty to seventy expirations, and remains, therefore, at the surface ten or eleven minutes. When the breathing time is over, or, as the whalers term it, he has his "spoutings out," the head sinks slowly; the "small," or the part between the "hump" and the "flukes," appears above the water, curved with the convexity upwards; the flukes are then lifted high into the air, and the animal having assumed a straight position, descends perpendicularly to an unknown depth. This last act is called "pecking the flukes," and those who are on the look-out call loudly when they see it—"There goes flukes." The whale continues thus hidden beneath the surface for one hour and ten minutes; some will remain an hour and twenty minutes, and others only for one hour; but these are rare exceptions. Mr. Beale gives us very graphic accounts of the mode of capturing the Sperm whale, which, when excited, seems to be a truly formidable antagonist. Perhaps, however, the most stirring incident, amongst the many daring encounters which have from time to time been recorded, is that given by the Rev. Henry T. Cheever, in his little work entitled "The Whaleman's Adventures in the Southern Ocean," which is edited by that distinguished navigator and cetaceologist, the Rev. Dr. Scoresby. Thus runs the terrible story:—"The most dreadful display of the whale's strength and prowess yet authentically recorded, was that made upon the American whale ship *Essex*, Captain Pollard, which sailed from Nantucket for the Pacific Ocean in August, 1819. Late in the fall of the same year, when in latitude 40° of the South Pacific, a school of sperm whales was discovered, and three boats were manned and sent in pursuit. The mate's boat was struck by one of them, and he was obliged to return to the ship, in order to repair the damage. While he was engaged in that work, a Sperm whale, judged to be eighty-five feet long, broke water about twenty rods from the ship, on her weather bow. He was going at the rate of about three knots an hour, and the ship at nearly the same rate, when he struck the bows of the vessel, just forward of her chains. At the shock produced by the collision of two such mighty masses of matter in motion, the ship shook like a leaf. The seemingly malicious whale dived and passed under the ship, grazing her keel, and then appeared at about the distance of a ship's length, lashing the sea with fins and tail, as if suffering the most horrible agony. He was evidently hurt by the collision, and blindly frantic with instinctive rage. In a few minutes he seemed to recover himself, and started with great speed directly across the vessel's course to windward. Meanwhile the hands on board discovered the ship to be gradually settling down at the bows, and the pumps were ordered to be rigged. While working at them, one of the men cried out—"God have mercy! he comes again!" The whale had turned at about one hundred rods from the ship, and was making for her with double his former speed; his pathway white with foam. Rushing head on, he struck her again at the bow, and the tremendous blow stove her in. The whale dived under again and disappeared, and the ship filled and fell over on her broadside, in ten minutes from the first collision. After incredible hardships and sufferings in their open boats, on the 20th December the survivors of this catastrophe reached the low island called Ducies, in latitude 24° 40′ south, longitude 124° 40′ west. It was a mere sandbank, nearly barren, which supplied them only with water and, very scantily, sea-fowl. On this uninhabited island, dreary as it was, three of the men chose to remain, rather than again commit themselves to the uncertainties of the sea. They have never since been heard from, the island being seldom visited. On the 27th of December the three boats, with the remainder of the men, put away together for the island of Juan Fernandez, at a distance of two thousand miles. The mate's boat was taken up by the *Indian* of London, on the 19th of February, ninety-three days from the time of the catastrophe, with only three survivors. The captain's boat was fallen in with by the *Dauphin* of Nantucket, on the 23rd of the same month, having only two men living, whose lives had been eked out only through that last resort of hunger in the wretched, which words shudder to relate! Out of a crew of twenty, five only survived to make the ear of the world tingle at their strange eventful story."

Several other forms of Cachalot exist, which are considered by Dr. Gray and others as entirely distinct species. These are the Mexican Sperm Whale (*Catodon Colneti*); the Short-headed Whale (*Kogia breviceps*), which occurs in the neighbourhood of the Cape; and the Black-fish, or High-finned Cachalot (*Physeter Tursio*), which is undoubtedly distinct. This latter species, according to the testimony of Mr. Barclay, communicated to Mr. Bell, is frequently seen off the coasts of Zetland in summer. It was first described by Sir Robert Sibbald, who compared its long perpendicular dorsal fin to the mizen-mast of a ship. The specimen from which his description was taken was cast ashore on the Orkney isles in the year 1687.

FAMILY III.—DELPHINIDÆ.

Under this head naturalists have included a great number and variety of cetacean species, which are collectively recognized by their double rows of teeth, or, in other words, by teeth in both jaws. They have smooth palates, and the nostrils are united into a single, lunate, transversely disposed blow-hole. In some species the teeth are deciduous; in all they are simple in structure, and of a more or less conical form; the head is likewise of moderate size. The intestinal canal is not furnished with a cœcum.

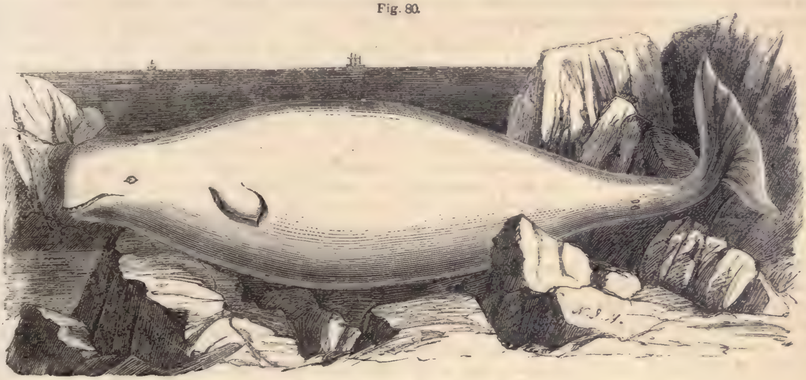
THE BOTTLE-HEAD (*Hyperoodon Butzkopf*) is an inhabitant of the north sea, and occasionally makes its appearance on our shores. It is readily distinguished by the attenuated character of the fore-part of the muzzle, which is prolonged so as to resemble a beak, and was, in consequence, termed the Beaked whale by Pennant. The earliest account we have of its occurrence, is that given by Dale in his "History of Harwich," from a specimen taken off the coast, near Maldon, in the year 1717. Its length was fourteen feet, the circumference of the body seven and a half; the flippers being seventeen inches, and the dorsal fin a foot in length. On this subject Dr. Collingwood makes the following remark in his *brochure* previously cited:—"In the Philosophical Trans. for 1787, in the paper by Hunter 'On the structure and economy of whales,' is a meagre account of bottle-nosed whales with two teeth, with a figure of the animal. Hunter adds, that 'it was caught above London bridge in the year 1783, and became the property of the late Mr. Alderman Pugh, who very politely allowed me to examine the structure, and take away the bones. It was twenty-one feet long.' Mr. Bell's figure is a reduced copy of our whale as given by John Hunter. Hunter was doubtful of its species, saying, that it resembled *Delphinus Tursio* (the Bottle-nosed dolphin), but was of a different genus, having only two teeth in the lower jaw, concealed by the gum. The belly was white, shaded off to the dark colour of the back. He, however, rightly conjectured that it was the species described by Dale ("Harwich," 411, pl. 14), viz. *Hyperoodon Butzkopf*, and supposes it to have been a young one, as he mentions a skull which must have belonged to one thirty or forty feet long." Dr. Collingwood has, we fear, in the remaining part of his "note" confounded Dale's and Hunter's specimens, and has called the editor of Pennant to account for a discrepancy in respect of measurement—himself altogether overlooking the circumstance, that Dale's specimen was stranded seventy years before Hunter's example appeared in the Thames. In our edition of Pennant (1776) the length of the Maldon specimen is correctly given as fourteen feet, and thus corresponds with the original description; in the edition to which Dr. Collingwood refers, it is given as eleven feet, which is probably a misprint. In conclusion, we may observe, that a series of careful dissections of another example of this rare and interesting cetacean may be seen in the Anatomical Museum of the University of Edinburgh.

THE NARWHAL (*Monodon monosceros*)—Plate 27, fig. 86—or Unicorn-whale, is readily distinguished by its remarkable tusk-like tooth which projects several feet in a horizontal direction from the left side of the upper jaw; the tooth of the opposite side being imperfectly developed, and remaining permanently concealed within the alveolus. It is not certain whether these teeth should be regarded as incisors or canines, as their sockets are placed between the maxillary and intermaxillary bones; yet, from the circumstance of the base of their roots being somewhat in front of the inciso-maxillary suture, we incline to the persuasion that they are incisors. The left nostril is smaller than the right. The colour of the adult Narwhal is dark above, whitish and marbled at the sides, underneath; in young individuals the hide is uniformly black. The Narwhal is a swift swimmer, and gregarious in its habits; and as it feeds chiefly upon small molluscous animals, it is difficult to say what is the express purpose of the large tusk. According to Dr. Scoresby, it is employed to destroy large fishes, such as skates and turbot, specimens of this whale having been found to contain the remains of such fishes in their stomachs. The Greenland missionary, Mr. Egede, a translation of whose work was published in London in 1745, stated that the tusk is used in piercing ice for the purpose of enabling the creatures to obtain fresh air, without always seeking the open water. Others regard it simply as a weapon of offence and defence, and many exaggerated accounts of its powers in this respect have been recorded by Lacépedè and others. The ivory of the tusk is very white and dense, and capable of yielding a high polish. Lacépedè, in his "Histoire Naturelle des Cetacées," gives a figure of the head of a Narwhal in which both of the teeth were developed to nearly equal length. The quality of the oil obtained from the blubber is superior, and the flesh is much prized by the Greenlanders. Several instances have been recorded of this animal's appearance on our shores. The first is that described by Tulpius in 1648, the specimen being twenty-two feet long. Another was thrown on the Lincolnshire coast, near Boston, in 1800, and a third was found close by the shore, at the entrance of the sound of Weesdale in Zetland, on the morning of the 27th of September, 1808. The last specimen was most carefully anatomized by Dr. Fleming of Edinburgh, who was then minister of Bressay, and who afterwards communicated a minute description to the Wernerian Society, which is published in the first volume of the Transactions, p. 131, with three accompanying figures. The animal measured only twelve feet from the snout to the notch which divides the tail. The flippers were fifteen inches in length; the tusk measured only thirty-nine inches; and, as in others, was spirally grooved or twisted, and striated externally from right to left, tapering to a blunt and solid point. The oil yielded by this example was of inferior quality. Dr. Fleming expressed an opinion that there might be two species of Narwhals, viz., the common and the small-headed—referring the example in question to the latter. Respecting the Lincolnshire specimen which was taken at the village of Frieston, near Boston, Sir Joseph Banks, in a letter to Dr. Fleming, observes:—"The animal when found, had buried the whole of its body in the mud of which the beach is there composed, and seemed safely and securely waiting the return of the tide. A fisherman going to his boat saw the horn, which was covered up, and trying to pull it out of the mud, raised the animal, who stirred himself hastily to secure his horn from the attack" Although Sir Joseph Banks communicated similar particulars to

Lacépedè, the French naturalist afterwards carelessly stated in his well-known work that the specimen was captured at Boston in America; and Mr. Shaw in his "British Miscellany," actually represented this celebrated Lincolnshire specimen, with two fully developed teeth! Strange errors!

THE NORTHERN BELUGA (*Beluga Catodon*) or White whale, derives its name from the uniformly white colour of the skin. It is an inhabitant of the northern seas generally, being especially numerous off the coast of Greenland, in Hudson's Bay and Davis Strait. The Northern Beluga forms a very striking object, and is remarkable for its elegant symmetry and activity. According to Scoresby it is not at all shy, but often follows ships, herding in numbers to the extent of forty or fifty individuals, which are seen gracefully tumbling above and below the ocean's surface. Two examples have been captured off the British coast. One of these was seen in the Medway as recently as 1846, and it was subsequently shot near Upnor castle. It measured rather more than thirteen feet in length. The other was killed in the Frith of Forth, near Stirling, on the 6th June 1815. A full account of this specimen (fig. 80) is given by Dr. Barclay and Mr. Neil in the third volume of the Wernerian Society's Transactions, and the skin may be seen, beautifully preserved, in the Natural History Museum of the Edinburgh University. On the authority of Mr. Bald of Alloa, Mr. Neill informs us, "that the animal generally passed upwards when the tide was flowing, and returned down the frith with the ebb; this sometimes happened every day, and sometimes once in two or three days; it came frequently to the surface, and was well known for about three months by the name of the white whale. It was supposed to run up the river in pursuit of salmon, and it was at last killed by the salmon-fishers, near the Abbey of Cambuskenneth. The animal had been attacked both with fire-arms and spears," and Dr. Barclay found one of the musket balls in the lungs. It was a male specimen, and measured thirteen feet four inches in length. The flesh of the Beluga is considered good eating by the Greenlanders, whilst the oil is still more highly extolled. Neither the male nor the female exhibit any dorsal fin. The dam usually produces two young at a birth, the suckers having at first a bluish-grey colour. The example shot in the Medway was furnished with thirty-six teeth; twenty in the upper, and sixteen in the lower jaw; but it would seem that the teeth of the upper jaw are deciduous in old individuals. In the Edinburgh specimen there were thirty teeth, eighteen above and twelve below.

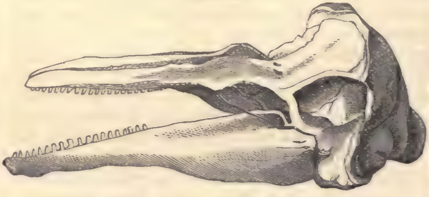
Fig. 80.



The Northern Beluga (Beluga Catodon)

THE COMMON PORPOISE (*Phocæna communis*) or Porpesse, is well known to the inhabitants of the shores of our sea-girt islands. It is the most abundant of all the Cetacea which visit our coasts. The hide exhibits a uniformly deep black colour, except along the central line of the belly where it is whitish. A full-grown Porpoise varies in length from five to eight feet. In dissecting several examples, we have been particularly struck with the immense length of the intestines, and in one example, shot in the Frith of Forth, we found five intestinal cestode worms, four of which measured about ten feet each in length, besides others, parasites in the lungs and liver. These entozoa are described in the 22nd volume of the Linnæan Society's Transactions. Porpoises frequently travel some distance up our rivers, and it is very interesting to watch their playful antics as they tumble to and fro on the light fantastic wave. They visit the Thames nearly every year, and sometimes venture as far as London Bridge. Mr. Bell records an interesting note of their appearance many years ago in the river Wareham, in Dorsetshire. On one occasion, at the close of the year, two that were taken in this river yielded sixteen gallons of oil. "One of them was found to have milk, which some gentlemen tasted, and pronounced to be salt and fishy. About the same season, three years afterwards, three others were driven up the river to the town of Wareham; they were full-grown animals, all about the same size. A fence was put across the river above and below them, in order to retain them for exhibition; but they plunged so violently, and their cries—which they continued during the night as well as the day—were so distressing, that after the third day of their captivity, they were, like the former ones, taken from the water and cut up." Porpoises sometimes herd in very large numbers, and on these occasions commit terrible havoc amongst shoals of herrings, mackerel, salmon, &c. Our conception of their destructive powers is by no means lessened when we consider the number and form of their teeth (fig. 81); there being usually from ninety to a hundred of these organs, from twenty to twenty-five occurring on either side of each jaw, above and below. They are somewhat flattened in form, their crowns being also more or less knobed. The flesh is esteemed a delicacy by the Greenlanders, and also by the inhabitants of our western isles. In the time of Henry VIII. and Elizabeth, it was considered a royal fish, and appeared to be much relished by the courtiers of their day.

Fig. 81.



Skull of the Porpoise (Phocæna communis).

THE CAAING WHALE (*Globiocephalus deductor*).—This species is also known as the ROUND-HEADED PORPOISE, BOTTLE-HEAD, SOCIAL WHALE, HOWLING WHALE, BLACK WHALE, and in the catalogue of the British Museum is given as the PILOT WHALE (*G. Svineval*). As the generic name implies, the upper aspect of the head is globular; the species is further distinguished by its long pectoral flippers and black skin, the belly and throat being white along the central line. The jaws are seldom furnished with more than fifty teeth. The Caaing Whales herd in large numbers. Mr. Bell states, that an entire shoal of seven hundred and eighty individuals was once captured at Sumburgh in Zetland; and between the years 1809 and 1810 another shoal came on shore at Hvalfiord in Iceland, consisting of no less than one thousand one hundred and ten examples, all of which were taken. Their appearance off the coasts of Orkney, Zetland, and the Faroe Isles, is by no means infrequent, and they prove a source of wealth to the inhabitants. "On the appearance of a shoal," says Mr. Bell, "the sailors endeavour to get to seaward of their victims, and gradually closing upon them, drive them onwards like a flock of sheep, and urge them by shouts and missiles towards the shore; when one of them, some say a leader, being forced on the beach, a curious scene of self-immolation is acted by the whole herd. They are then attacked by the entire population, who despatch them by various means; and the cries and dying struggles of the poor animals, some in and some out of the water, the shouts and exertions of the men, and the troubled and bloody sea, combine to form a scene of no trifling interest and excitement." According to Dr. Traill, they blindly follow a single leader, which if driven on shore, guarantees the destruction of the entire herd, as their mutual attachment will not allow them to forsake the first victims. Their favourite food appears to be various species of cuttle-fish, though they also take ordinary fish. They yield excellent oil.

THE GRAMPUS (*Grampus orca*) is a large, stoutish-built species of whale, measuring upwards of thirty feet in length, and having a girth of fourteen feet, or more The anterior part of the head terminates less abruptly than in any of the preceding members of this family, and the animal is further recognized by its pectoral and dorsal fins—the former being broad and rounded, the latter long and elevated. It is an inhabitant of the northern seas generally, and very frequently appears upon our coasts. The largest which has been taken on these shores is that recorded by Lacépède, from notes communicated to him by Sir Joseph Banks. In the words of Mr. Bell, this specimen "occurred in the Thames in 1793. Struck by three harpoons, he rushed off with the boat in which were the persons who had struck him, towed it twice to Greenwich, and once as far as Deptford, against a strong tide running eight miles an hour, notwithstanding the repeated pike wounds which he received whenever he appeared above water. It was killed opposite Greenwich Hospital, and its expiring struggles were so violent that no boat dared to approach it. It was a very large one, being no less than thirty-one feet in length, and twelve in circumference." A specimen taken in Lynn harbour on the 19th November, 1830, weighed three tons and a half. They pretty frequently visit the friths of the Tay and Forth; a large number appeared in the latter bay during July and August, 1793. The Grampus proves very destructive to salmon.

THE COMMON DOLPHIN (*Delphinus Delphis*)—Plate 28, fig. 88—seldom exceeds seven or eight feet in length, though individuals have been occasionally found to measure as much as ten feet. It is readily distinguished from the foregoing species by its almost straight back, and by its attenuated, compressed, and prolonged muzzle, which bears some resemblance to a beak. The jaws are of equal length, and furnished with a very numerous series of teeth, upwards of a hundred and eighty having been counted in some specimens; their form is slender, and slightly curved inwards, and they interlock during the closed state of the jaw. The Dolphin is an inhabitant of the northern seas and the Atlantic Ocean, occasionally making its appearance off our coasts. It is a remarkably active species; and, notwithstanding its voracious and gluttonous habits, was formerly highly esteemed for its flesh. Pennant records, on the authority of the celebrated Dr. Caius, that one which was taken in his time was presented to the Duke of Norfolk, who distributed portions of it amongst his friends. "It was roasted and dressed with porpesse sauce, made of crumbs of fine white bread, mixed with vinegar and sugar." The Common Dolphin feeds principally on fish.

THE BOTTLE-NOSE DOLPHIN (*Delphinus Tursio*) is another North Sea species which has occasionally made its appearance on the British shores. Difficulties exist respecting its identification. It is distinguished from the common dolphin chiefly by the projection of the lower jaw beyond the upper. There is some reason to believe that the dolphin (*D. truncatus*) described by Mr. G. Montague in the third volume of the Wernerian Society's Transactions, is referable to this species. This specimen was captured off Totness in Devonshire, in the summer of 1814. After the animal had been exhibited, the bones were regarded as rejectamenta, and thrown into the river Dart. Mr. James Cornish, however, subsequently succeeded in recovering the skull, the length of which was twenty inches and a half. "On each side of the upper jaw," says Mr. Montague, "there are sockets for twenty teeth, besides a long depression behind the posterior socket." The under jaw was somewhat longer, and contained twenty-three sockets on either side. Such of the teeth as were discovered were for the most part worn and flat on their crowns. The others, it seems, were knocked out, and freely distributed amongst the curiosity-loving people of Totness!

SOWERBY'S DOLPHIN (*Diodon Sowerbœi*), of which only a single example has yet appeared, is characterized chiefly by the possession of a single pair of teeth, occupying the lower jaw. It was cast ashore near Brodie House, Elginshire, and is thus described by Mr. Sowerby, in the first volume of his well-known "British Miscellany":—"The animal is oblong; black above, nearly white below; sixteen feet long, eleven in circumference at the thickest part, with one fin on the back; head acuminated; lower jaw blunt, longer than the upper, with two short lateral bony teeth; upper jaw sharp, let into the lower one by two lateral impressions corresponding with the teeth; opening of the mouth, one foot six inches. Under the throat are found two diverging furrows, terminating below the eyes, which are small, and placed six inches behind the mouth. Spiracles lunate, the ends pointing forwards." The specimen was a male.

Amongst the many other numerous and interesting members of the present family known to exist, we can only particularize the following:—

PERON'S DOLPHIN (*Delphinapterus Pèronii*), RIGHT-WHALE PORPOISE, OR WHITE-BEAKED DOLPHIN. This species is found on the southern side of the equator, off and between the opposite coasts of Africa and Brazil. It is gregarious in its habits, and readily distinguished by the lustrous white beak, abdomen, and pectoral fins, the other parts being quite black. The head is pointed and slightly convex,; the jaws, in different examples, are furnished with from thirty-eight to forty-two on each side, above and below.

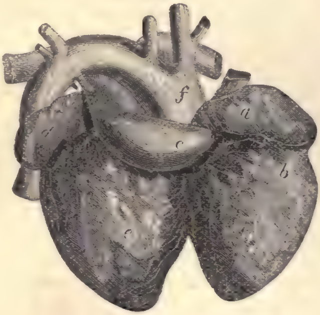
THE INIA (*Inia Geoffroyii*), or BOLIVIAN DOLPHIN, is a very singular animal, having the breathing aperture placed far backward on a line with the pectoral fins. The dorsal fin is small. The lips are deeply cleft to beneath the eye; the auditory meatus being likewise unusually large. Mr. Blyth observes that the species is also remarkable as "occurring thousands of miles from the sea, appearing to inhabit only the remote tributaries of the Amazon, and the elevated lakes of Peru. The singular character of possessing bristly hairs on the snout has also been observed in them when very young. This species has large swimming paws, and thirty-four teeth on each side, above and below, all of them rough, marked with deep and interrupted furrows, and of an irregular, mammillary shape behind, which is very peculiar. A female specimen measured seven feet long, and the males are stated to be double that size; colour variable, commonly pale blue above, passing into a roseate hue beneath. It comes more frequently to the surface than the marine species, and is generally met with in troops of three or four individuals."

THE SOU-SOU (*Platanista Gangetica*) or Dolphin of the Ganges, is another cetacean of considerable interest, frequenting the mouths, and ascending sometimes high up the rivers. It is readily distinguished by its elongated and laterally compressed snout, swollen at the extremity from enlargement of the jaws, which latter support in front numerous long, conical teeth; there being thirty of these organs on each side, above and below. The breathing opening has the form of a longitudinal fissure, whilst the upper borders of the maxillary bones are prolonged upwards in a singular manner. The eyes are very small, and at first sight scarcely discernible. The pectoral flippers are subtriangular, the dorsal fin being placed far back. The Sou-Sou attains a length of seven feet. It was originally described by Pliny, under the generic title here employed.

FAMILY IV.—MANATIDÆ.

It is a matter of opinion whether it be more correct to associate this family with the present order, or with the Pachydermata; for whilst its members appear, by external characters and habits, more intimately allied with the Cetacea, their internal structure, on the other hand, plainly demonstrates a close alliance with the latter group. Some have suggested, not without reason, that they might almost be treated as a separate order; but, all things considered, it is perhaps better, and certainly more convenient, to adopt our present allocation. All the members of this family are vegetable feeders, and, in consequence, most commonly styled Herbivorous or Phytophagous cetacea. In conformity with their algous diet, we find the teeth modified so as to secure due mastication of the coarse fuci, the molars, when present, being more or less flattened on the crown. The intestinal canal attains a prodigious length, and in the Rytina is said to measure upwards of twenty times the entire length of the animal. The stomach is constricted near the centre, and more or less complicated by cœca and follicles in the different species. The skin is rather hairy, and the face furnished with bristle-like whiskers; but the tail is flattened out transversely as in ordinary cetaceans—a circumstance very strongly insisted on by those who, with ourselves, prefer to retain these animals in the present order. The limbs or paddles are furnished with claws; but there is no trace of posterior extremities. The nostrils are quite separate, placed in front of the abrupt snout, opening near the upper lip. The front of the jaws is covered with horny plates. The mammæ are two in number, and situated below the thorax; and there are from fifteen to nineteen pairs of ribs. One of the most interesting visceral modifications is that of the heart (fig. 82), which may be said to have two apices, seeing that the ventricles are partially separated from one another, and independent at their lower ends. In the annexed cut the letters of reference indicate as follows:—*a*, right auricle, *b* right ventricle, *c*, pulmonary artery, *d*, left auricle, *e*, left ventricle, *f*, the aorta. In most particulars the skeleton strictly conforms to the cetacean type; but in the head and neck we notice several departures, the cervical vertebræ remaining quite distinct, whilst the head is shortened and comparatively massive in some species. In the Dugong—Plate 34, fig. 139—the intermaxillary bones are enormously developed for the implantation of its incisive tusks, whilst the lower jaw is remarkably broad and deep. These cranial peculiarities are not present in other allied genera. The several bony elements of the fore-limbs are more perfectly formed than in the zoophagous cetaceans, the would-be position of the hinder extremities being indicated by an attenuated V-shaped bone, constituting a rudimentary pelvis. True V-shaped bones also exist along the hœmal aspect of the caudal vertebræ. In conclusion, we have only to observe that all the Manatidæ are found near the sea-coast, and near estuaries and mouths of rivers, up which they occasionally wander to a considerable distance, feeding on marine fuci and other kinds of aquatic vegetation.

Fig 82



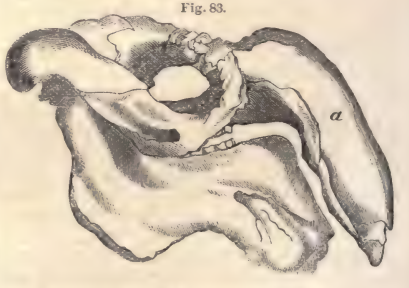
Heart of the Dugong (Halicore Dugong).

THE MANATEE (*Manatus australis*)—Plate 36, fig. 84—is an inhabitant of the shores and great open rivers of the South American continent, being particularly abundant off the coasts of Guyana and Brazil, where it is commonly known as the Sea-cow. The term Lamantin is sometimes applied to it as well as to another species. The Manatees are gregarious in their habits, and like other Cetacea are devotedly attached to their young, which they defend with great vigour. In the adult state the skin presents a greyish-black colour, whilst, in common with other species of the same genus, the flippers are each provided with four flattish nails, that of the thumb being wanting. They have thirty-two molar teeth, that is, eight on either side above and below, their crowns being irregularly flat, square-shaped, and divided transversely by a central groove. There are no canines or incisors except in extremely young individuals. Under ordinary circumstances the habits of the Manatee are mild and inoffensive. It is readily taken with the harpoon, and is chiefly valued on account of its flesh, which is stated to be excellent eating. Though formerly very plentiful, the Sea-cow hunters have greatly reduced their numbers. When these animals raise the anterior half of the body out of the water, they display a fanciful resemblance to a human figure, and this circumstance induced our ancient navigators to believe in the existence of sirens, mermen, and mermaids.

Two other species of the genus Manatus are also known—the Lamantin, properly so called (*M. Senegalensis* of Adanson), which is a native of the western coasts of tropical Africa, and the Mexican Sea-cow (*M. latirostris*), a very large species, upwards of fifteen feet in length, found on the shores of Florida, Mexico, Surinam, and some of the West Indian islands.

THE INDIAN DUGONG (*Halicore Dugong*)—Plate 26, fig. 85—is a species of very considerable interest, though much smaller than the foregoing, seldom measuring more than seven or eight feet from the tip of the abrupt and flattened snout to the end of the broad crescentic tail. On turning to the drawing given at Plate 26, fig. 85, it will be seen that the flippers are not furnished with nails, but their margins are thickened and tuberculated. One of the most characteristic features of this animal arises out of the presence of two large incisors or tusks in the upper jaw, *a* (fig. 83), the molars being flat, and varying numerically from eight or ten to twenty, according to age and other circumstances. "In the female Dugong," says Professor Owen, "the growth of the permanent incisive tusks of the upper jaw is arrested before they cut the gum, and they remain through life concealed in the premaxillaries. The tusk is solid, is about an inch shorter, and less bent than that of the male; it is also irregularly cylindrical, longitudinally indented, and it gradually diminishes to an obtuse rugged point. The base is suddenly expanded, bent obliquely outwards, and presents a shallow excavation." Speaking of other peculiarities, the same authority also observes that the external form of the Dugong is "not so well calculated for moving rapidly through the water as that of the dolphin and other carnivorous cetacea, which subsist by a perpetual pur-

Fig. 83.



Skull of the Indian Dugong (Halicore Dugong).

suit of living animals. In these the snout is conical and peculiarly elongated, and in some, as in *Delphinus Gangeticus*, the jaws are produced to an extreme length, so as to give them every advantage in seizing their swift and slippery prey; whilst in the herbivorous Dugong the snout is as remarkable for its obtuse, truncate character—a form, however, which is equally advantageous to it, and well adapted to its habits of browsing upon the algæ and fuci which grow upon the submarine rocks of the Indian seas. As, from the fixed nature of the Dugong's food, the motions of the animal during the time of feeding must relate more immediately to the necessity of coming to the surface to respire; its tail, the principal organ of locomotive ascent and descent, is proportionally greater than in the true Cetacea, its breadth being rather more than one-third the length of the whole body." The Dugong enjoys a pretty wide geographical distribution, being found not only in the Indian seas generally, but also in the Red Sea; formerly large numbers inhabited the shores of the Isle of France. According to Sir Stamford Raffles, and others, they usually feed at two, three, or four fathoms' depth of water. They are abundant off the Malayan coast, and especially at the mouth of the Johore river. The native Malays spear them at night-time; their presence being indicated by a snuffing noise. When caught, the tail is raised up out of the water, as the animal is quite powerless in this position. The habits of the Dugong are gregarious, herding, says Leguat, to the extent of three or four hundred individuals at a single spot. Like other cetaceans, they display extraordinary attachment to their young, defending them to the death; on being taken the suckers utter a short and sharp cry. All accounts agree in considering the flesh to be delicate and pleasant eating.

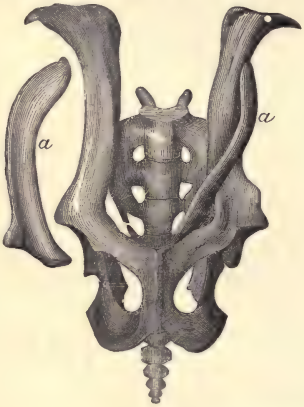
One or two other Dugongs have been described. Rüppell considers the form inhabiting the Red Sea as a separate species; and this opinion is shared by several naturalists. It was called by him *Halicore Tabernaculi*, from a notion that the skin was employed by the Jews in veiling the tabernacle. The Australian Dugong (*H. australis*) is generally admitted to be distinct.

STELLER'S RHYTINA (*Rhytina Stelleri*)—Plate 26, fig. 86—is one of those interesting mammalian forms whose extinction is only of very recent date, yet so complete as to have left scarce a wreck behind. Discovered in 1741, after a few short years it entirely succumbed to the rapacity of our greedy race, who, without even affording naturalists a fair opportunity of unravelling its curious structure, have swept it from its native shores, and well-nigh obliterated all trace of its existence. It is well for science, that Steller, whose worthy name it bears, was among the number of those unfortunate voyagers who were wrecked on the inhospitable shores of the dreary island where this animal was first discovered; and it is still more fortunate that he left an authentic record of his discovery, which was published subsequent to his death by the Academy of St. Petersburg in 1749, and afterwards at Halle in 1753, in a separate treatise entitled "Ausführliche Beschreibung von sonderbaren Meerthieren." At the time of its discovery on Behring's Island, it does not appear to have been particularly abundant, and since the year 1768 no trace of its presence in a living state has ever been recorded. There can be no doubt, however, that considerable numbers previously existed, and these, it appears, have all fallen a prey to the Aleutian sea-otter hunters, whose exploits have been so graphically described by the Russian explorer Von Kotzebue, and others. Steller's Rhytina attained a length of upwards of twenty-four feet, its greatest circumferential girth being about twenty feet. According to Steller the pectoral flippers contained no digits, which, if correct, is very remarkable; and what is equally singular, there were no teeth either above or below, their absence being amply compensated by the presence of hard undulating lamellæ—partly made up of horny tubes and partly calcareous—which covered the jaws internally, and performed all the necessary functions of bruising, masticating, and detaching the sea-weeds, on which these animals lived. Another peculiarity is mentioned as affecting the skin; the epidermis being fully an inch in thickness, and composed of thick cylindrical fibres, which were curiously folded or fissured, so as to present a very rugged uneven surface; the true dermis remaining comparatively thin. The surface of the hide exhibited a deep brown or purplish-black tint. The head was small when compared with the bulk of the body; the tail, on the contrary, extensively developed and of an oval figure. The stomach is described by Steller as small. In the catalogue of Cetacea, preserved in the British Museum, this species is alluded to under the title of the Morskaia Korova or *Rhytina gigas*. It has also been described under the generic appellations of Stellerus, Manatus, and even Trichechus.

ORDER XIII.—MARSUPIALIA.

As indicated in the general introduction to the class Mammalia, the present order exhibits several characters widely differing from those displayed by any of the foregoing, the distinctive features having especial reference to the parts concerned in the reproduction and the rearing of their young. It is almost superfluous, therefore, to recapitulate the facts—succinctly stated at page 8—which have led naturalists to acquiesce in the arrangement of Cuvier, who first grouped the marsupials together under the ordinal title above retained; nevertheless it may be well to observe, in brief, that the external and internal characters by which these animals are at once recognized depend upon the presence of abdominal pouches or foldings of the skin, which are inverted in the females for the purpose of concealing, protecting, and nourishing the young, and everted in the males for the lodgment of the reproductive glands. The young are born in an imperfectly developed state, and transferred by the mother into her marsupium, there to be nurtured through the final stages of their fœtal condition, in a manner to be immediately described. Intimately associated with this external specialization of integument, we find the bones of the pelvis, supplemented by two styliform elements, or marsupial trochlear bones, as they are more properly called. Both in the male and female important muscles are attached to these osseous appendages, which are firmly articulated to the anterior border of the pelvis by a broad connecting surface, bound down by interarticular fibrous bands, like those observable in other pelvic synchondroses or ligamentous joints. The marsupial bones vary considerably in different species, being elongated, flattened, and curved in the wombat, and comparatively straight and narrow in Perameles. In the koala they are very large and scimitar-shaped, *a* (fig. 84); but only one inch and a half in length in Myrmecobius. The ordinary abdominal muscles connected with these bones aid them in supporting the marsupium and its contents, but a special muscle —analagous to the so-called "cremaster" of the male —is developed in the female, whose function it is to expel the milk-secretion of the mammary glands when the young have become located in the pouch and duly attached to the teats. The mode of their connection with the long nipples is very curious; as, in order to allow of respiratory action being carried on by the fœtus in marsupio, it is clearly necessary that the milk should be conveyed directly into the stomach, without the chance of its blocking up the air passages; and as yet—to take an example—the little kangaroo can hardly display any involuntary functions, such as might regulate the flow of milk, and thereby, in connection with the ordinary reflex action of the larynx, obviate the necessity of any special modification of the pharyngeal organs. To prevent choking, therefore, the windpipe is extended upwards to the soft palatal membrane, which, acting like a sphincter, embraces its patent outlet, bringing it into immediate contact, and also in continuation with the nasal passages. At the same time the teat of the mother is thrust far back in the mouth, and the injected milk flows freely down to the stomach, precisely in the same manner as the food of the porpoise, in the first instance, passes the pharynx by two passages into the gullet! One can hardly refrain from comment on so remarkable a modification of structure destined to meet the exigencies of these interesting species; and as, perhaps, our sentiments on this score may derive additional cogency when expressed in the language of an authority—who has contributed more than any other individual to the unravelling of the intricacies and significance of the marsupial structure—we have little hesitation in inviting attention to Professor Owen's comment, including additional details respecting this organization, as it occurs in the kangaroo:—"Thus aided and protected by modifications of structure, both in the system of the mother and its own, designed with especial reference to each others' peculiar condition, and affording, therefore, *the most irrefragable evidence of creative foresight*, the small offspring of the kangaroo continues to increase, from sustenance exclusively derived from the mother, for a period of about eight months. During this period the hind legs and tail assume a great part of their adult proportions; the muzzle elongates; the external ears and eyelids are completed; the hair begins to be developed at about the sixth month. At the eighth month the young kangaroo may be seen frequently to protrude its head from the mouth of the pouch, and to crop the grass at the same time that the mother is browsing. Having thus acquired additional strength, it quits the pouch, and hops at first with a feeble and vacillating gait, but continues to return to the pouch for occasional shelter and supplies of food till it has attained the weight of ten pounds. After this it will occasionally insert its head for the purpose of sucking, notwithstanding another fœtus may have been deposited in the pouch; for the latter attaches itself to a different nipple from the one which had been previously in use." Having advanced thus much concerning the most important features of the order, it only remains for us to notice very briefly some other minor characteristics. Speaking generally, it may be said that the numerous species which are thus linked together into one group, present very striking differences in their structure, and consequently also in their habits of living. These are for the most part indicated in the union of the skull and in the form of the teeth, of the two clavicles into a single furcular bone, and in the condition of the craniodental peculiarities bearing a strict relation to their carnivorous and insectivorous propensities on the one hand, and to the mixed nature of their food and purely phytivorous habits on the other. In this respect alone, therefore, three or four, more or less, natural groups are presented to us. But it is not alone in the skeleton that such correlative peculiarities exist, as many scarcely less interesting deviations affect the brain, the circulatory organs, the digestive organs, and its associated chylo-poietic viscera. Into these, however, it is not our province to enter; and it must, therefore, suffice us to

Fig. 84.



Pelvis and marsupial bones of Koala (Phascolarctos cinereus).

observe in conclusion, that the varied members of this order are for the most part met with on the great Australian continent and its adjacent islands. Some few inhabit the warmer regions of America, and, what is still more interesting, fossil remains of others have been found in Europe, in the tertiary gypsum beds of Paris, and in the Stonesfield slate of the great oolite formation in England.

Family I.—PHASCOLOMYDÆ.

This family is probably represented by a single living species only, but the fossil genus, *Diprotodon*, established by Professor Owen, is also included in it, or in his rhizophagous tribe of marsupials, which is the same thing. This small group is characterized by the possession of two incisor teeth in either jaw, above and below; there are no canines, and a large interspace separates the incisives from the molars, which are twenty in number, the anterior four being spurious; they have indistinct roots and flattened crowns. All the feet are pentadactylous, but the thumb of the hind feet is rudimentary and clawless. The tail is extremely short. The stomach is provided with a special gland; the cœcum being small, broad, and furnished with a vermiform appendage.

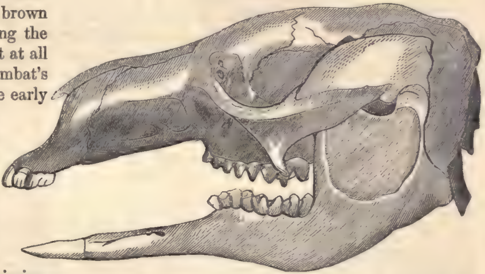
THE WOMBAT (*Phascolomys Wombat*)—Plate 28, fig. 93—is a short thick-set animal, from two to three feet in length, and weighing about thirty pounds. The head is large, and furnished with small ears, the tail measuring only half an inch. In the skeleton, however—if three of the outer-iliac vertebral segments be reckoned as belonging to the category of sacral elements—there are no less than thirteen or fourteen caudal vertebræ. Another peculiarity in the skeleton arises out of the presence of fifteen or sixteen pairs of ribs—a number considerably exceeding that of other marsupials. The fur is thick, and of a sandy brown colour below and at the sides, being darker along the line of the back. The eyes are small, and not at all prominent. One of the best accounts of the Wombat's habits is that furnished by Colonel Collins at the early part of the present century. "This animal," he says, possesses no claim to swiftness, as most men could run it down. Its pace is hobbling or shuffling, something like the awkward gait of a bear. In disposition it is mild and gentle, as becomes a grass-eater; but it bites hard and is furious when provoked." His friend, Mr. Bass, he adds, "never heard its voice but at that time. It was a low cry between a hissing and a whizzing, which could not be heard at a distance of more than thirty or forty yards. He chased one, and with his hands suddenly lifted it off the ground without hurting it, and laid it upon its back along his arm like a child. It made no noise nor any effort to escape, not even a struggle." Subsequently, however, the little animal shrieked and made its escape, whilst Mr. Bass was preparing to tie it up. Colonel Collins further on observes, that besides living in Furneaux's island, the Wombat inhabits the hills to the west of Port-Jackson. "In both these places its habitation is underground, the animal being admirably formed for burrowing; but to what depth it descends does not seem to be ascertained. According to the account given of it by the natives, the Wombat of the mountains is never seen during the day, but lives retired in its hole, feeding only in the night; that inhabiting the islands is seen to feed all times of the day." Its food consists chiefly of coarse grass and roots. The flesh is said to be delicate and excellent eating. The female produces three or four young at a single birth.

From the examination of a skull brought from South Australia, Professor Owen has expressed his belief in the existence of a second species of Wombat, which he has provisionally named *Phascolomys latifrons*. The fossil genus *Diprotodon* attained gigantic proportions, being nearly as large as the hippopotamus.

Family II.—MACROPIDÆ.

The Kangaroos are readily distinguished by the disproportionate bulk of the hinder parts of the body as compared with those in front, this feature being more particularly noticeable in the development of the tail and hinder extremities. The feet are greatly elongated by an extension of the metatarsal bones and digital phalanges, their soles being applied to the ground during progression. The powerful tail acts as a fifth limb during the slower movements of the body, and forms, in conjunction with the hind legs, a firm tripodal basis of support during the state of rest. The fore limbs are short, pentadactylous, attenuated, and furnished with compressed curved claws, the nails of the hind feet being straight and tetradactylous. Speaking generally, the body presents a conical outline, tapering from below upwards. The ears are largely developed and oval in shape; but a more important character is seen in the teeth—(fig. 85.) According to Professor Owen, there are in the normal condition of the permanent dental series six superior and two inferior incisors, no canines, four premolars equally divided above and below, and sixteen true molars, that is, four on either side of the upper and lower jaws. In the genus of Kangaroo Rats or Potoroos (*Hypsiprymnus*) canines are present in the upper jaw. In the true Kangaroos the central incisors of the upper are not longer than

Fig. 85.



Skull of the Great Kangaroo (Macropus giganteus).

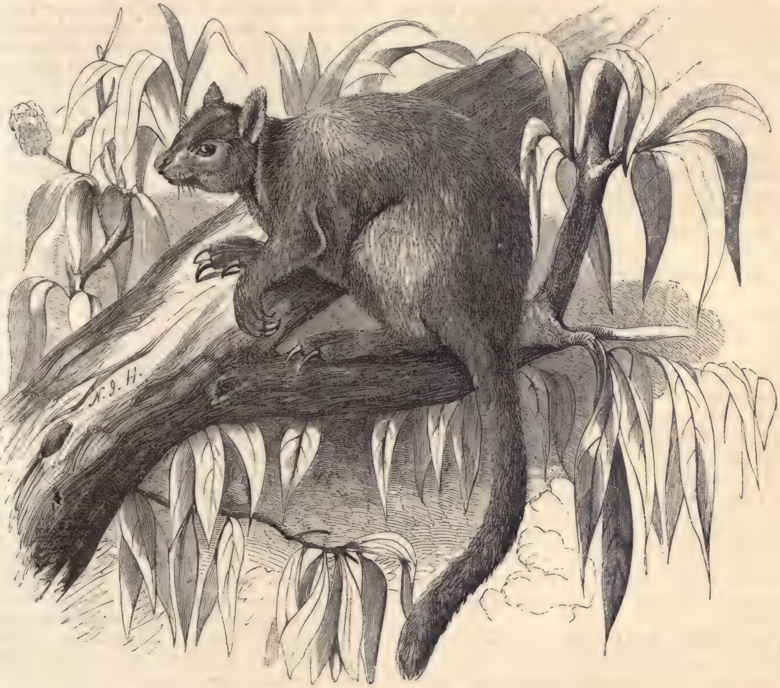
the others, the outer pair being at the same time comparatively broad. In the Potoroos the middle incisors are of considerable length. In all the members of this family the head is rather small, and the upper lip is cleft. These animals possess complicated stomachs, and they display great powers of leaping; only using their anterior limbs when feeding. They are found almost exclusively in Australia, some few occurring in New Guinea and Van Diemen's Land.

THE GREAT KANGAROO (*Macropus giganteus*)—Plate 29, fig. 92—is an animal of very considerable interest, not only on account of its amazing powers of leaping and marsupial peculiarities, but on account of the circumstance of its being the largest living and indigenous quadruped inhabiting the great Australian continent. An adult specimen measures upwards of four feet in length, not including the tail, which would give us an additional three feet; its weight occasionally exceeding one hundred and forty pounds. The capture of the Great Kangaroo in its native haunts is attended with great and varied excitement; and when it was discovered by the sailors under Captain Cook, during one of his ever-memorable voyages, they were not slow to extol and exaggerate its leaping propensities. It is now very commonly hunted with dogs; but the natives have a peculiar method of their own. According to Captain Grey, as quoted by Mr. Dallas in his excellent little manual entitled "A Natural History of the Animal Kingdom,"—"the native advances quietly in the direction where he expects to find his game, with every sense on the alert to give him notice of its approach. When the animal is near him he is seen to assume an attitude of intense attention, and, at a given signal, his wives and children, who accompany him, drop immediately upon the ground. When the savage is thus occupied, you will see at about a hundred yards from him, a kangaroo erect upon its hind legs, and supported by its tail. It is reared to its utmost height, so that its head is between five and six feet above the ground, its short paws hang by its side, its ears are pointed—it is listening as carefully as the native, and you see a little head peering out from its pouch to inquire what has alarmed its mother. But the native moves not: you cannot tell whether it is a human being or the charred trunk of a burned tree which is before you, and for several minutes the whole group preserve their relative position. At length the kangaroo becomes reassured, drops upon its fore paws, gives an awkward leap or two, and goes on feeding; the little inhabitant of its pouch stretching its head further out, testing the grass its mother is eating, and evidently debating whether or not it is safe to venture out of its resting-place, and gambol about amongst the green dewy herbage. Meantime the native moves not until the kangaroo, having two or three times resumed the attitude of listening, and having like a monkey scratched its side with its fore paw, at length once more abandons itself in perfect security to its feeding, and playfully smells and rubs its little one. Now the watchful savage, keeping his body unmoved, fixes the spear first in the throwing stick, and then raises his arms in the attitude of throwing, from which they are never again moved until the kangaroo dies or runs away. His spear being properly secured, he advances slowly and stealthily, no part moving but his legs. Whenever the kangaroo looks round, he stands motionless in the position he is in when it first raises its head, until the animal, again assured of its safety, gives a skip or two, and goes on feeding. Again the native advances, and this scene is repeated many times, until the whistling spear penetrates the devoted animal." The Great Kangaroo and others of its kindred, breed freely in this country, many British-born individuals existing in the Zoological Society's Gardens and in private collections. The flesh is said to be good eating, and not unlike venison in flavour.

The so-called SOOTY KANGAROO (*Macropus fuliginosus* of Desmarest), as well as two other large species described by Mr. Gould in his attractive folio "Monograph on Kangaroos," as *M. ocydromus* and *M. melanops*, are, in Mr. Waterhouse's view, only probable varieties of the Great Kangaroo. Very many other species, however, are known to exist, of which we can only specify the following:—The RED KANGAROO (*M. laniger* of Gould) is a large species occupying the interior of the Australian continent, and frequenting the banks of the river Darling and the Murrumbidgee. The GREAT ROCK KANGAROO (*M. robustus* of Waterhouse), or Black Wallaroo of the natives, is found in hilly localities. The female has a silvery or grey colour, and is much less than the male; the fur of the latter exhibiting a rich black tint. Amongst the smaller species may be mentioned the BLACK-GLOVED KANGAROO (*M. Irma*), which is about thirty inches in length and found in Western Australia. Desmarest's RED-NECKED KANGAROO (*M. ruficollis*), a species well-known in this country, inhabits New South Wales and King's Island. A very tiny species, called the PANDEMELON WALLABY (*M. Thetides*), is only twenty inches long, excluding the tail, and is much sought after for the sake of its flesh. The RED-BELLIED WALLABY (*M. Billardierii*) is a gregarious species, as is also the BRUSH-TAILED ROCK KANGAROO (*M. penicillatus*). LE BRUN'S KANGAROO (*Halmaturus Asiaticus* of Gray) is an inhabitant of New Guinea; it possesses a very long narrow head with shortish ears, the fore-legs being comparatively strong. The fur exhibits a greyish colour generally, more or less tinged with yellow, especially underneath. Respecting the small HARE KANGAROO (*Lagorchestes leporides*), Mr. Gould records the following amusing little incident:—"While out on the plains," he says, "I started a hare kangaroo before two fleet dogs; after running to the distance of a quarter of a mile, it suddenly doubled and came back upon me, the dogs following at its heels. I stood perfectly still, and the animal had arrived within twenty feet before it observed me, when, to my astonishment, instead of branching off to the right or the left, it bounded clear over my head, and on descending to the ground I was enabled to make a successful shot, by which it was procured." Mr. Gould specifically distinguishes several other closely allied forms, and gives beautiful figures of them in his large work.

In the Tree-Kangaroos the anterior and posterior limbs have nearly the same length, whilst the tail is longer than the body. The strongly-curved and powerful claws are also rendered subservient to their arboreal climbing habits. Two species have been described by M. Salomon Müller, which he respectively denominates *Dendrologus ursinus* and *D. inustus*—Fig. 86. Both have moderately well developed ears, whilst the two superior central incisor teeth are scarcely longer than the outer pair.

Fig. 86.



The Tree-Kangaroo (Dendrologus inustus).

THE POTOROO (*Hypsiprimnus minor*), or KANGAROO RAT—Plate 29, fig. 91—is a gentle, timid, little animal, about the size of our common rabbit. It is a native of New South Wales, and tolerably abundant in the neighbourhood of the river Weragambia. The fur exhibits a greyish-brown colour generally, being reddish above and white underneath the belly. The ears are of large size; the tail being also conspicuously developed; more uniform in thickness than obtains in kangaroos proper, very flexible, and slightly tufted at the extremity. The fore-limbs still display much disparity when compared with the stout posterior pair; the same relation holds good in regard to the feet, the three central claws of the pentadactylous fore-feet being strikingly developed. The muzzle is so considerably attenuated and produced, that in the skull the nasals are seen to extend beyond the level of the upper jaw. This animal is further distinguished by the remarkable length of its anterior grinding teeth, or premolars, which are also sculptured by vertical groves externally; these dental characteristics are also present in congeneric forms, several of which have been described as distinct species by Ogilby, Gould, and others.

FAMILY III.—PHALANGISTIDÆ.

The marsupials associated under this head are commonly called Phalangers, and although only some of them exhibit highly exalted leaping powers—in virtue of assistance derived from a membranous expansion of the skin at the sides of the body—yet, on the whole, they form a tolerably distinct group. Among the more distinguishing peculiarities are those which have reference to their partially carnivorous diet and arboreal habits. The disparity between the hind and fore legs no longer exists, whilst the posterior feet have become pentadactylous, the thumb remaining unarmed, and the second and third toes conjoined as far forward as the base of the claws. The teeth vary considerably in different genera; thus, in the true Phalangers there are only eight incisors, disposed as in the kangaroos, and sixteen constant true molars—although occasionally we find also two or four canines. In all cases the upper central incisors are comparatively large, the lower being conspicuous and procumbent as in the Kangaroos. In the Pigmy Petaurist, or Flying Phalanger, there are twenty-four permanent molars in addition to the four canines, whilst other members of the genus Petaurus display twenty-eight molars, the anterior twelve coming under the category of spurious grinders. In the genus Phascolarctos, on the other hand, there are only two canines occupying the upper jaw, and twenty molars, the anterior four being false. All the Phalangers are provided with a simple stomach and a long cœcum. In most cases the tail is extensively developed, but in the aberrant genus Phascolarctos it is merely rudimentary. In some, the tails are prehensile. The habits of the family are arboreal and nocturnal; they feed partly upon fruits and leaves, and on small birds.

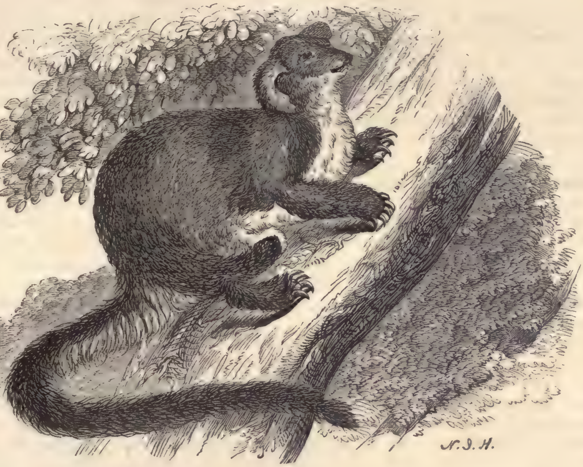
THE VULPINE OPOSSUM (*Phalangista vulpina*) is a very common species in Australia, and is much hunted by the natives, who are particularly fond of its flesh. It is called in their strange language the *Whatapooroo*. Although somewhat fox-like in appearance, it is a much smaller animal, measuring about twenty-six inches in length, exclusive of the tail, which would give us some additional fifteen inches. The fur exhibits a ruddy buff colour generally, inclining to a ferruginous tint at the lower part of the throat; the tail is black, except at the root. The ears are about one inch and a half long; the limbs being also comparatively short. Similar characters likewise exist in another form inhabiting Van Diemen's Land; this is a larger and darker coloured animal, being considered by Messrs. Gould and Ogilby to be distinct; they have accordingly imparted to it the combined generic and specific title *P. fuliginosa*.

THE SPOTTED PHALANGER (*Cuscus maculata*), or SCHAM-SCHAM, has been generically separated by Lacépède and Témminck on what appears to be very satisfactory grounds; for we find no less than twelve incisors, six above and the like number below—the total number of all the teeth together amounting to forty. In this animal the tail is prehensile and naked at the narrowed extremity, where it is also marked with rugosities. The Scham-Scham is an inhabitant of New Guinea and the Moluccas, being also called *Coescoes* by the natives of the latter island—hence the generic title adopted by the French naturalist. The fur has a thick woolly texture, having a whitish ground colour, which is spotted by large, more or less isolated deep brown patches, some of the maculæ occasionally running into one another. The body is stoutish throughout; the ears being remarkably short. It appears to be slothful in its movements; at least such is the character given to it by M. Lesson.

THE MOUSE-LIKE PHALANGER (*Phalangista gliriformis*)—Plate 30, fig. 94—has been elevated by Dr. J. E. Gray into a subgeneric rank, under the title of *Dromicia*, on account of certain dental peculiarities; but, "as these modifications of the teeth are unaccompanied by any change of general structure or of habit, whilst those teeth which most influence the diet are constant, it is obvious," says Professor Owen, "that these differences of dentition are unimportant, and afford no just grounds for subgeneric distinctions." The particular tooth-characters here adverted to, have reference more particularly to the presence of only three true molars on each side of either jaw; but apart from this feature the Mouse-like Phalanger possesses many points of interest. It is remarkably small, the body measuring only four inches in length, excluding the tail, which would give us upwards of three inches and three quarters more. This organ is black at the root, and clothed with short stoutish hairs, except at the tip, where it is naked. The ears are large and almost destitute of hair. This little marsupial is only found in Van Diemen's Land. Excellent figures of it are given by Waterhouse and Gould, and by Mr. Bell in the sixteenth volume of the Linnæan Society's Transactions.

THE SCIURINE PETAURIST (*Petaurus sciureus*), or SUGAR SQUIRREL.—The distinguished naturalist Shaw separated the flying Phalangers into a distinct genus—Petaurus—on account of the peculiar membranous expansion of the skin existing between the anterior and posterior limbs, associated with a non-prehensile hairy tail. Five or six species have been described. These are—*P. taguanoides*, the largest, with a brown fur, whitish-grey underneath, and hairy ears (fig. 87); *P. Australis*, or the Hopoona-Roo, with long and naked ears, the fur being fulvous below and marked by dark-coloured bands along the central line of the back; *P. breviceps*, *P. sciureus*, *P. Ariel*, *P. breviceps*, and *P. pygmæus*. As has been already indicated, the last-named species presents some trifling departure from the other Petaurists as regards the teeth, which led Desmarest to give it the generic title of *Acrobates*. Respecting the habits of the Sugar Squirrel—which are very similar in all the species—Mr. Bennett has supplied the following interesting account—"During the day the animal generally remains quietly nestled in the hollows of trees, but becomes animated as night advances, and skims through the air supported by its lateral expansions, half leaping, half flying from branch to branch, feeding upon leaves and insects. This peculiar mode of locomotion can scarcely be considered a true flight, inasmuch as the cutaneous folds, which serve the purposes of wings, seem rather destined for the mere support of the animal in its long and apparently desperate leaps, than for raising it in the air, and directing its course towards any given object. For this latter purpose they are indeed but little fitted by their structure, the want of proper muscles in a great measure incapacitating them from performing such offices as are dependent on volition. It may be doubted, however, whether these animals are entirely destitute of the power of exercising their will in their flight-like leaps. For the following anecdote bearing upon this subject, we are indebted to our friend Mr. Broderip, who related it to us on unquestionable authority—'On board a vessel sailing off the coast of New Holland was a squirrel—Petaurus—which was permitted to roam about the ship. On one occasion it reached the mast-head, and, as the sailor who was despatched to bring it down approached, made a spring from aloft to avoid him. At this moment the ship gave a heavy lurch, which, if the original direction of the little creature's course had been continued, must have plunged it into the sea. All who witnessed the scene were in pain for its safety; but it suddenly appeared to check itself and so to modify its career that it alighted safely on the deck.'" All the species are natives of New South Wales. The Sciurine Petaurist is also found in New Guinea and its adjacent islands. It is sometimes called the Norfolk Island Flying Squirrel, having been originally described as inhabiting the outlying and isolated spot of land which bears that name. The fur is ash-coloured above and whitish underneath. A brownish line extends from the muzzle to the root of the tail, the latter organ being tufted and black at the tip. In the little mouse-like Pigmy Petaurist the hairs of the tail are regularly disposed in two rows, one on either side, like the barbs of a feather.

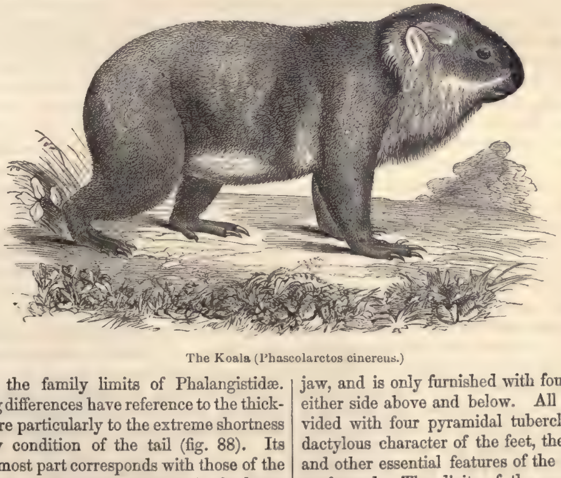
Fig. 87.



The large Petaurist, or Flying Squirrel (Petaurus taguanoides).

THE KOALA (*Phascolarctos cinereus*).—Although this animal has been generically separated from the Petaurists and true Phalangers, yet there is no reason to place it outside the family limits of Phalangistidæ. The most striking differences have reference to the thick-set body, and more particularly to the extreme shortness and rudimentary condition of the tail (fig. 88). Its dentition for the most part corresponds with those of the Phalangers; but it never displays canines in the lower jaw, and is only furnished with four premolars, one on either side above and below. All the molars are provided with four pyramidal tubercles. To the pentadactylous character of the feet, the very large cœcum, and other essential features of the family, it is entirely conformed. The digits of the anterior feet separate

Fig. 88.



The Koala (Phascolarctos cinereus.)

into two groups, the pollex and index fingers antagonizing the outer three, so as to afford a strong prehensile action. The Koala is a native of various parts of Australia. It is about the size of a small dog, measuring nearly two feet in length. The fur is coarse, thick, and long, possessing a peculiar ashy-brown colour. It is eminently arboreal in its habits, feeding only upon leaves and buds, but partly residing in small burrows excavated beneath the roots of trees. The female is wont to carry her offspring on her back for a considerable period. Its movements, however, are comparatively sluggish under ordinary circumstances.

FAMILY IV.—PERAMELIDÆ.

Looking at the dental peculiarities displayed by the members of this family—commonly called Bandicoot Rats—it will be at once evident that we have passed on to a group of marsupials far less phytivorous in their habits than any of the preceding. In short, we have taken up a carnivorous type, and find, accordingly, well-developed canines, numerous incisors—ten above and six below—and, in addition, there is a full complement of molars—twelve false and sixteen true; but the characters of the latter conform more closely to the insectivorous than to the carnivorous mammals, properly so called. Co-ordinating with the multiple arrangement of the teeth, we find a marked extension of the jaws, combined with a corresponding attenuation of the muzzle. The hind feet are much longer and stouter than the anterior pair, whereby their leaping powers are increased, the second and third toes of the posterior limbs being also conjoined as far as the base of the claws, whilst the digit equivalent to the thumb is perfectly developed in the fore-feet. The outer toes are very short and placed far back—almost concealed. The other toes are all furnished with powerful claws, enabling their possessors to dig and burrow with facility. Bandicoots are found only in Australia and Van Diemen's Land.

THE LONG-NOSED BANDICOOT (*Perameles nasutus*).—Four or five species are referable to the present genus; for in addition to the one here named, naturalists have recognized *P. Lagotis*, *P. Gunnii*, and *P. obesula* as specifically distinct. The first of these three had been generically separated by Professor Owen, under the title of *Thalaconus*. It is also commonly known as the Philander, and is furnished with long ears and an extensive bushy tail; the muzzle being very much produced and abruptly attenuated. The outer incisor of the upper is not separated widely from its fellows. *P. Gunnii* of Dr. J. E. Gray is an inhabitant of Van Diemen's Land, and is distinguished by its possession of a very short, white tail; the haunches being also marked by several pale-coloured bands. In addition to insects, it appears to be very fond of bulbous roots. *P. obesula* is commonly termed the Spring Bandicoot—Plate 30, fig. 95. In the Long-Nosed Bandicoot the ears are moderate and pointed, the fur having a brownish-grey tint above, passing into white beneath; the nose is prolonged beyond the jaw. In all, the cœcum is of moderate size. According to Professor Owen, the marsupial pouch, "at least in the full-grown females of *P. nasuta*, *P. obesula*, and *P. Lagotis*, has its orifice directed downwards or towards the cloaca, contrariwise to its ordinary position in the marsupials; this direction of the pouch evidently relates to the procumbent position of the trunk when supported on the short fore and long hind legs." During progression, the Bandicoots move the hind-feet together alternately with the fore-feet, after the saltatory manner of rabbits. Their flesh is said to be good eating.

OGILBY'S BANDICOOT (*Chœropus castanotis*), or the PIG-FOOTED BANDICOOT, is a remarkable species, apparently possessing only two toes on the fore-feet; the pollex of the hinder feet is also absent, the outer pair of digits being very conspicuously developed. The claws of the latter, as well as of the didactyle fore-feet, are particularly strong and adapted for burrowing. This species carries forty-six teeth—eight incisors above and six below, four canines, twelve spurious, and sixteen true molars. The ears are long, elliptical, and nearly naked; but the tail is altogether wanting.

Another aberrant form of Bandicoot has been described by Gérvais, and subsequently by Waterhouse and Gould, under the title of *Tarsipes rostratus*. It is a native of Western Australia, arboreal and insectivorous in its habits, furnished with moderate ears, pentadactylous feet—the thumb of the hinder pair being clawless—and a long prehensile tail. It possesses only two procumbent incisors in the lower jaw, four canines, and a variable number of molars, only twelve remaining constant. This anomalous species has no cœcum.

FAMILY V.—DASYURIDÆ.

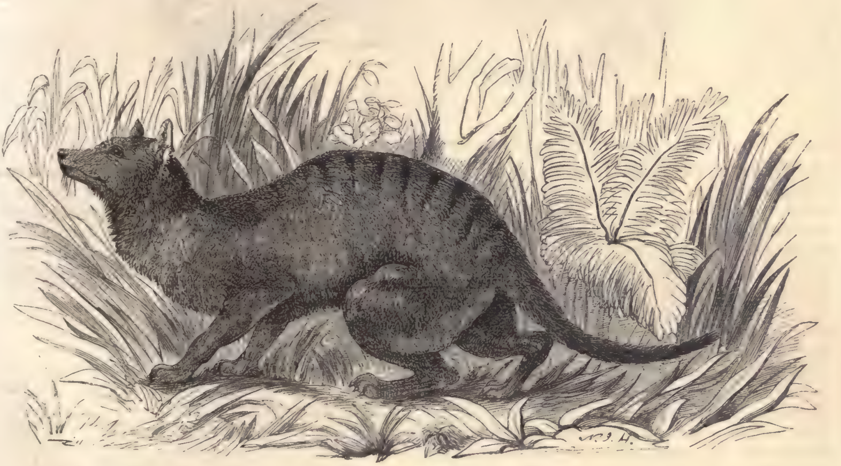
The Dasyures constitute a highly carnivorous group of marsupials, clearly representing the true Carnivora of the placental mammals. The typical forms have eight incisors above and six below, four well-developed canines, eight pre-molars, and sixteen true molars—in all, forty-two teeth. According to Professor Owen, "the spurious molars have a pointed, compressed, triangular crown, with a rudimental tubercle at the anterior and posterior part of its base. The grinding surface of the true molars in the upper jaw is triangular; the first presents four sharp cusps; the second and third each five; the fourth, which is the smallest, only three. In the lower jaw the last molar is nearly of equal size with the penultimate one, and is bristled with four cusps, the external one being the longest." In other respects the lower grinders correspond with those opposed above. The anterior limbs are pentadactylous, but the posterior pair have usually only four digits, the pollex being occasionally represented by a small, clawless, warty tubercle. Some of the species are strong and powerfully-built animals. In all, the tail is moderately long, non-prehensile, and generally hairy throughout. The various species are natives of Australia and Van Diemen's Land.

THE URSINE OPOSSUM (*Dasyurus Ursinus*), or "Native Devil," as the Tasmanian colonists term it, is a truly formidable species. It is about the size of our common badger, being furnished with a coarse black fur, which is here and there irregularly marked with whitish spots. The tail is rather bare underneath. By all accounts these ursine opossums are perfect pests, and prove terribly destructive to poultry, sheep, &c., hardly anything coming amiss to them. According to Mr. Harris, they were extremely numerous when the first attempts were made to settle at Hobart Town; but they appeared to have done good service in affording supplies of fresh food to the convicts sent thither; their flesh is said to eat like veal. As the settlement increased, their numbers diminished, and they were driven into the forest, where they are still pursued and secured by traps. They are extremely rapacious and savage, both in the wild and semi-domesticated state. They utter a hollow barking noise, something like that of a dog; and judging from their resentful persecuting behaviour, appear to have well earned the colonial appellation by which they are so significantly characterized.

Several other species are known to exist; and of these we may mention—The Longtailed Dasyure (*D. macrourus*), having a rudimentary hallucinar wart, by which it is distinguished from the two following—Mangê's (*D. Mangii*), a smaller species of an olive ground colour; and Shaw's Dasyure (*D. viverrinus*), or Wild Cat of the Tasmanians—Plate 31, fig. 97—which has a black fur. All three are marked by large white spots on the body, and in the two first the tail is similarly distinguished.

THE THYLACINE (*Thylacinus Harrisii*) is a native of Van Diemen's Land, and is variously termed by the colonists "pouched wolf," hyæna, tiger, zebra, opossum, and so forth. It enjoys the distinction of being the largest of all the carnivorous marsupials, and is about the size of an ordinary fox-hound, but stouter built, and standing lower on the legs. The fur exhibits a dusky brown color, the crupper being barred transversely by sixteen deep black bands running parallel from side to side (fig. 89). The Thylacines are highly carnivorous, and prove terribly destructive to the flocks of sheep, which they seem to prefer to any other kind of animal food, though formerly they must have subsisted, almost entirely, on phalangers and kangaroos. They are seldom captured alive, and appear to be very wary animals. The Thylacine is nocturnal in its habits. It is furnished with forty-six teeth; but the circumstances most worthy of note are seen in the strongly carnassial character of the molar teeth, and in the great size of the canines, as compared with other non-placental mammals. No other living species exists; but a fossil Thylacine has been discovered in the tertiary gypsum beds of Paris—a fact of extreme interest, taken in connection with other extinct marsupial remains elsewhere found in Europe, and demonstrating the wide geographical distribution these creatures maintained in former times.

Fig. 89.

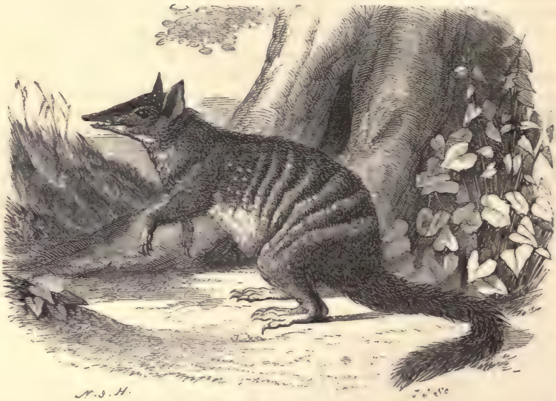


The Pouched Wolf or Thylacine (Thylacinus Harrisii).

THE COMMON PHASCOGALE (*Phascogale penicillatus.*)—The present genus embraces three or four very small marsupials, whose dental formula is precisely the same as that of Thylacinus; whilst the only differences appertain to the less carnassial character of the molars—serving to approximate them more closely to the insectivorous type—and to an elongation of the central incisives, which is more particularly manifest in the upper series. All the species are remarkably minute; one of them—the *Antechinus minutissimus* of Gould—being the smallest living marsupial, and measuring less than two inches and a half long, exclusive of the tail. In many particulars these animals resemble the entomophagous opossums. The common Phascogale is about the size of our common rat. The fur is short, thick, and woolly, and of a uniform ashy color above, passing into white beneath. The tail is well developed, and very bushy towards the tip. Its habits are arboreo-nocturnal, and in common with its congeners it preys chiefly on insects and small birds. This species is a native of Australia generally, but has not, we believe, been found in Van Diemen's Land.

THE BANDED MYRMECOBE (*Myrmecobius fasciatus*) is an inhabitant of South-western Australia, having been originally discovered and procured by Lieutenant Dale, at about ninety miles to the south-east of the mouth of the Swan River. The Myrmecobe (fig. 90) is at once distinguished from its insectivorous congeners, and also from all other marsupials, by the large number of teeth, of which there are fourteen incisors—eight above and six below—four canines, twelve pre molars, and no less than twenty-four true molars; in all, fifty-four. The dental formula thus approaches very closely to that of the extinct—and probably marsupial—genus Thylacotherium. Professor Owen also observes, that it is to a certain extent comparable to the dentition of the armadillos "in the small size of the molar teeth, their separation from each other by slight interspaces, and their implantation in sockets, which are not formed upon a well-developed ridge or process. The molars, however, present a distinct multicuspidate structure, and both the true and false ones possess two separate fangs as in other marsupials." There does not appear to be any necessity to consider this animal as the type of a distinct family. It is about the size of a rat, measuring ten inches from the nose to the root of the tail. The fur exhibits a rufous ground tint generally, the feet being more decidedly red, the back dark brown and banded over the crupper by whitish hairs, similar to those of the thylacine. The head displays a sharply-acuminated muzzle and short pointed ears. The tail is seven inches long and bushy, the anterior feet pentadactylous, and the hind pair four-toed, all the digits being armed with strong, compressed, curved claws. Its habits are arboreal, and it burrows under the roots of trees in search of insects.

Fig. 90.

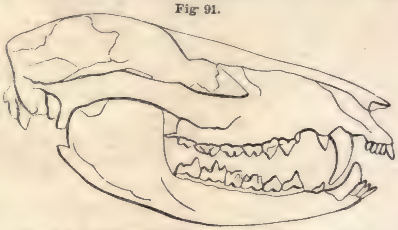


The Banded Myrmecobe (Myrmecobius fasciatus).

FAMILY VI.—DIDELPHIDÆ.

Under this head are collected together all the American marsupials or opossums, properly so called. The species are extremely numerous, for the most part confined to Brazil and the neighbouring provinces of Guyana, Paraguay, and Peru; a few being found in Mexico and California, and one in the United States. A single species only occurs in Chili. The opossums are comparatively small, seldom exceeding the size of our domestic cat; the jaws are furnished with eighteen incisors—ten above and eight below—four canines, and twenty-eight molars, the anterior twelve being spurious (fig. 91). The head is pointed, the ears large and naked, the gape of the mouth very wide, the produced muzzle being furnished with a few long bristles. The tail is prehensile, more or less semi-nude or scaly. The feet are all pentadactylous, but the pollex of the hinder pair is opposable to the other digits, and clawless. The opossums are arboreal and nocturnal in their habits, preying chiefly upon birds, eggs, insects, and even fruit. Their movements, however, are rather sluggish than otherwise, and their presence is recognizable by the peculiar fetid odour of their skin. They have a simple stomach and moderately capacious cœcum.

Fig. 91.



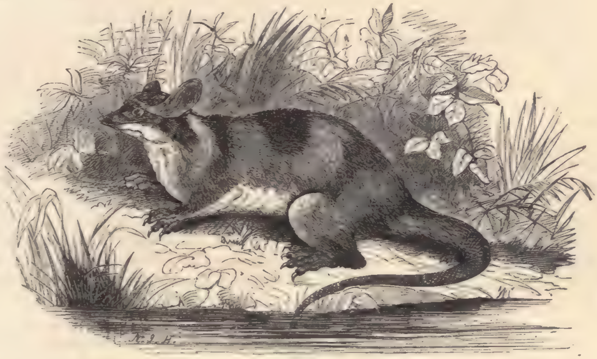
Skull of the Virginian Opossum (Didelphis Virginiana).

THE VIRGINIAN OPOSSUM (*Didelphis Virginiana*), or COMMON POSSUM—Plate 30, fig. 96—enjoys the distinction of being the first known to naturalists. It is widely distributed throughout the United States, and is especially abundant towards the south. A full-grown specimen measures twenty inches in length, exclusive of the tail, for which other fourteen inches must be allowed. The fur has a dusky-brown colour, the individual hairs being whitish, with brown tips. The legs are nearly black, the digits being lighter coloured or whitish. The head is fulvous-white, with a dusky suffusion round the eye; the ears are black, with a yellow patch at the upper border; the root of the tail is also dark coloured. The Possum is very destructive to poultry, and proves a troublesome pest. The female produces sometimes as many as sixteen young at a birth, which, when at first transferred to the marsupial pouch, are extremely minute. The eyes of the young open about the fiftieth day, when the cubs are as large as ordinary mice. The flesh is said to be good eating.

Among the more interesting or noticeable of the other species, we may mention the following:—The TEXAS POSSUM (*Didelphis Californica*), which is distinguished by its smaller size, its less rounded and more pointed ears; the hairy or basal portion of the tail being also shorter. According to Mr. J. H. Clarke of the United States expedition, this species is particularly fond of the black persimmon, an abundant fruit on the borders of the Rio Grande. The *D. Murina* is found in Mexico, Guyana, Peru, and Brazil; the *D. dorsigera* in Surinam. "These species," as Van der Hoeven observes, "carry their young on the back when they are sufficiently developed to leave the teat, to which at first they were attached, whilst they throw their tails like tendrils round the caudal appendage of their parent." In both the tail is fully as long as the body, and the ears are largely developed. AZARA'S POSSUM (*D. Azaræ*) pretty closely resembles the Texas form. According to Mr. Spencer F. Baird, it is distinguished by its white head and neck, with a central dark stripe along the forehead to the dusky part of the nape. The ears and toes are flesh-coloured. The CRAB-EATING OPOSSUM (*D. cancrivora*)—so called from its propensity for eating these crustacea—is a large species, possessing no well-defined markings on the head; the generically distinctive, long, and sparsely scattered hairs of the short fur existing more or less abundantly in all the opossums. The fur exhibits a deep black colour.

THE YAPOCK (*Cheironectes variegatus*), or PETITE LOUTRE of Buffon, is an aquatic form of opossum inhabiting the river banks of Brazil and Guyana (fig. 92). The only point in which it appears to differ materially from the ordinary opossums, has reference to the palmated character of the feet, which are supplied with interdigital membranes. In all other particulars it conforms to the genus Didelphis. The Yapock is little more than a foot in length, exclusive of the tail, which is scaly and prehensile, and nearly as long as the body. It is an expert swimmer, and feeds upon fishes, crustacea, and other aquatic animals.

Fig. 92.

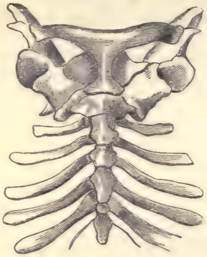


The Yapock (Cheironectes variegatus)

ORDER XIV.—MONOTREMATA.

IT is not a little significant of the universality of plan pervading all vertebrate formations, that we should find on examining the skeleton and viscera of the monotremes, a decided approximation to certain of the distinguishing characteristics of birds and reptiles. At first sight there is little to suggest this relationship, except in so far as the bill-like jaws of Ornithorynchus are admitted to resemble a duck's beak; but on closer examination, several oviparine features will be immediately discovered. M. Geoffroy St. Hilaire first gave the name of Monotremata to the small group of non-placental marsupial mammals here associated together, thereby indicating the termination of the urino-genital and intestinal passages by a single cloacal outlet—an arrangement also found in birds and reptiles. Equally striking peculiarities affect the skeleton, these being more especially manifest in the presence of two clavicles nearly conjoined, and applied against the upper surface of a single furcular bone; there are also well-developed coracoid bones, which are articulated to the sternum. In addition to this there are special osseous elements, termed epicoracoids, which are connected to the sternal and furcular bones, the scapulæ being likewise attached to the breastbone. In the accompanying woodcut (fig. 93), the furcular bone or episternum presents a T-shaped outline, with the lateral free ends directed towards the shoulder-blades. It conceals the clavicles, which are slender bones and not united at the mesial line. The epicoracoids are seen interposed on either side of the stem of the furcular bone, resting laterally on the thick coracoids, which latter are articulated to the episternum and manubrial bone of the sternum below and to the scapular above. Another circumstance worthy of remark is that the bones of the skull become very early consolidated; those of the face being much prolonged forwards and flattened out into the form of a beak, which is covered by a smooth, naked integument. The jaws are not furnished with teeth; but their place is supplied by numerous rows of horny dentelations, having their spinous points directed towards the throat, as obtains in the analogous buccal papillæ in the mouths of ruminants. They also exist on the tongue in the form of conical papillæ. The feet are short, particularly strong, and pentadactylous. The Monotremes have small eyes, no external ears, and very short tails. In the male Duck-bill the hind feet are armed with a perforated spur, its channel containing an excretory duct belonging to a special glandular structure placed at the back part of the thigh. This remarkable organ was formerly supposed to be a poison gland; but there is no good ground for such an opinion. Neither is it merely a weapon of offence and defence; for then we should probably not have the gland in connection with the spur, and the females would probably also be similarly armed. We have no doubt in our own mind that it is analogous to those supernumerary organs often found in the males of the lower as well as in the higher animals. "Since then," says Professor Owen, "this apparatus forms a sexual character, it may be presumed that its function is connected with that of generation. Whether the spur be a weapon for combat among the males, or—like the *spiculum amoris* of the snail—be used to excite the female, the injected secretion being an additional stimulus; or whether the spur be mechanically useful in retaining the female during the coitus, are conjectures which must be verified or disproved by actual observation." The females are furnished with mammary glands; but there are no external teats. The manner in which the function of lactation is performed, and many other facts bearing upon the question as to how the offspring are reared, still remain to be explained.

Fig 93.



Sternal apparatus of the Duck-bill (Ornithorhynchus paradoxus).

FAMILY I.—ORNITHORHYNCHIDÆ.

This family is represented by a single species, which is readily distinguished from the members of the succeeding family by its non-fossorial, palmate feet. It is also furnished with eight horny, tooth-like formations regularly disposed, two on either side above and below. The crowns of the anterior pairs are long and thin, those of the posterior set being broader and oval. The snout is prolonged, compressed, broad, and covered by a naked coriaceous integument; the lower jaw is shorter and narrower than the upper, and marked posteriorly by transverse lines. The tongue is very peculiar; the anterior half or narrow portion being covered with coarse papillæ, whilst the posterior division is broad, slightly overlapping the former, and armed in front by two prominent horny spines. The ornithorhynchus is furnished with cheek-pouches. The fur is hairy throughout; the tail being flattened, broad, and conspicuous.

THE DUCK-BILL (*Ornithorhynchus paradoxus*), or AUSTRALIAN WATER MOLE—Plate 31, fig. 99—is a native of New South Wales and Van Diemen's Land. A full-grown individual varies in length from eighteen to twenty inches, including the tail, which measures about five inches. The fur exhibits a tawny or rufous colour, one or other of these tints prevailing in different varieties. In the young state the skin is entirely destitute of hair, and the jaws are short, soft, and flexible. In the adult the tongue is placed far back, the tip being fully an inch behind the anterior opening of the bill. According to Professor Owen, "the raised posterior lobe of the tongue must impede the passage of unmasticated food to the pharynx, and doubtless tends to direct it on each side into the cheek-pouches, whence the ornithorhynchus may transfer its store at leisure to the molar teeth, and complete its preparation for deglutition. An air-breathing, warm-blooded animal, which obtains its food by the capture of small aquatic animals while submerged, must derive great advantage from the structure which enables it to transfer them quickly to a temporary receptacle, whence they may be extracted and masticated while the animal is floating on the surface or at rest in its burrow."

The Duck-bill feeds on small molluscous animals, various aquatic larvæ, and especially on water-bugs belonging to the genus *Naucoris*, which abound in the running streams and lakes of Australia. The most interesting account of the habits of this animal yet placed on record, is that given by Mr. Bennett in the first volume of the Zoological Society's Transactions. Speaking of one which he kept in a semi-captive state, occasionally tethering it to a stake by the river's side, he tells us that "it was exceedingly lively, swam in the centre of the stream, and appeared in excellent health and spirits. The water at one part of the river being very clear, I saw its movements distinctly under the water. On diving, it sank speedily to the bottom, swam there for a short distance, and then rose again to the surface; it ranged the banks, guiding itself in its progress according to the impressions received by the mandibles, which appeared to me to be used by it as very delicate organs of touch. It seemed to feed well; for whenever it inserted its beak into the mud it evidently procured some food from thence, as, on raising the head, after withdrawing the beak, the mandibles were seen in lateral motion, as is usual when the animal masticates. Although several insects were basking and fluttering about the surface of the water, close to it, no attempt was made to capture them, either from its not seeing them, or from its preferring the food which the mud afforded. The motions of the mandibles in this animal, when seeking its food in the mud and water, are the same as those of a duck when feeding in similar situations. After feeding it would lie sometimes on the grassy bank, and at others partly in and partly out of the water, combing and cleaning its coat as usual with the claws of the hind feet. After permitting it to swim, feed, and clean itself for an hour, it was replaced, although with great reluctance on its own part, in its box; it did not, however, as before, betake itself to repose, but commenced and continued a scratching on the sides of the box." During sleep the duck-bill rolls itself up in the form of a ball. For this, and many other interesting facts, we are indebted to Mr. Bennett, who has also given us a full account of the form and extent of the burrows which these animals construct in the banks of rivers. One of these burrows measured fully twenty feet in length. It commenced in some long grass about five feet from the water's edge, passed upwards in a serpentine direction, terminating near the surface of the ground in a rounded excavation, the lower part of this hollow forming a nest of dried grass and weeds. In this particular burrow Mr. Bennett captured an unlucky ornithorynchus, which, on being drawn out by the leg, manifested the most alarming evidences of fear, its heart palpitating violently. It did not scream, or make any attempt to bite; during its subsequent captivity, however, it frequently uttered a soft growl during the night, at which time it also made vigorous efforts to escape.

FAMILY II.—TACHYGLOSSIDÆ.

The members of this family are at once distinguished from the former by the mixed spinous and hairy character of their fur, as well as by the circumstance of their possessing a slender subulate muzzle and a merely rudimentary tail. On closer examination we find that the jaws are entirely edentulous, the palate being armed with several rows of small spines directed backwards. A more significant character is founded on the form of the tongue, which is long, narrow, rounded, and very extensile—hence the family name above given—closely resembling the lingual organ in their placental representatives, namely, the true ant-eaters and pangolins. The pentadactylous feet are short and thick, the digits being furnished with powerful falciform claws adapted for burrowing. The second and third digits of the hind feet are particularly long. The stomach is simple, capacious, and spherical when distended. The cœcum is moderately developed.

THE PORCUPINE ANT-EATER (*Tachyglossus Hystrix*), or AUSTRALIAN HEDGEHOG of the colonists, is a native of New South Wales and Van Diemen's Land, but is now rather rare in the first named locality. It is maintained by some, on grounds apparently tenable, that the forms proper to the two habitations are distinct species; but others consider the differences observable insufficient to prove a separate origin. Without offering a positive decision, we strongly incline to the belief that they are different animals, the form known as the Van Diemen's Land species (*Tachyglossus setosus*)—which, however, is not peculiar to that island, according to the testimony of Mr. Waterhouse—being provided with small and narrow digits, as compared with those of *T. Hystrix*, whilst the hairy appendages of the skin are also longer, the spines, on the other hand, being relatively short. Other minor differences likewise exist. These animals are about the size of our common hedgehog, varying in length from fourteen to eighteen inches. The hairy portion of the skin exhibits a chestnut colour, the spines being whitish except at their tips, which are black. Like hedgehogs, they roll themselves up when attacked on the open ground; but their safety is usually more effectually secured by burrowing in the earth, or by entering a previously constructed tunnel. These animals feed upon ants, captured by the protrusion and subsequent retraction of their extensile glutinous tongues, after the manner previously described in our account of the typical edentate ant-eaters or myrmecophagas.

Those who desire more extended information respecting the structure and economy of the monotreme marsupials, are referred to Professor Owen's elaborate article "Monotremata," contained in the third volume of Dr. Todd's Cyclopædia of Anatomy and Physiology; and also to Mr. Gould's large folio work on the "Mammals of Australia."

END OF MAMMALIA.

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THE MUSEUM

OF

NATURAL HISTORY.

ZOOLOGY.

CLASS II.—BIRDS.

Although the numerous and varied tribes of Birds undoubtedly come next in order after the Mammalia, we cannot point to any member of the latter class, which, in its general characters, really makes an approach to the birds. Some of the lowest mammals certainly present some resemblance to the oviparous Vertebrata in a physiological point of view; but the peculiarities exhibited by these rather indicate a relationship to the class of reptiles, and thus, in our classifications, the Birds form, as it were, a supplementary class, interpolated between the two similarly-quadruped groups of Mammalia and reptiles.

This view is remarkably in accordance with geological facts, as far as we can judge from the present state of our knowledge; the preponderating reptilian Fauna of the secondary period gives place, in the gradual evolution of organic nature, to the similarly preponderating mammalian Fauna of the tertiary epoch, whilst the traces of birds, such as they are, occur simultaneously with these from a very early period of time.*

Birds, like mammals, are warm-blooded, air-breathing, vertebrate animals, and, like them, possess a heart composed of four distinct cavities and voluminous minutely cellular lungs. The latter organs, however, present some differences from the corresponding parts in the Mammalia; they are not lobed, and, instead of being freely suspended in the cavity of the chest, they are attached to the inner surface of the dorsal part of this cavity. Moreover, the surface of the lung, instead of forming a closed sac, as in the Mammalia, is perforated by several large apertures, passing down through its substance to the main branches of the air-tubes, and, on the other hand, communicating externally with an extensive system of air-sacs, which penetrate to nearly every part of the body of the bird, and even occupy the internal cavities of those hollow bones, which, in the Mammalia, and indeed in the young bird, are filled with marrow. By this arrangement the air taken into the lungs may, to a considerable extent, penetrate, as it were, into the very substance of the bird's body, a circumstance of no small importance in reducing its specific gravity, and rendering it capable of being readily supported in the air by the action of the wings. So ready is the communication between these air-sacs and the lungs, that birds have even been known to breathe through a fractured wing-bone, when the ordinary air-passages have been closed by compression.*

Another anatomical character by which birds are distinguished from mammals, consists in the absence of the diaphragm or muscular partition, which, in the latter, separates the cavity of the chest from that of the abdomen, and which, by its movements, assists greatly in respiration; the alternate enlargement and diminution of the cavity of the chest by which this function is executed in birds, is effected by the alternate elevation and depression of the broad flat sternum.

As the power of flight is the principal general characteristic of the whole class of birds, we naturally expect to find the structure of the skeleton specially modified for the accomplishment of this object; and so completely are these expectations fulfilled, that it is impossible ever to mistake the skeleton of a bird for that of any other form of animal (see Plate 36). Nevertheless the parts described as occurring in the skeleton of a mammal, may invariably be traced distinctly. The distinctions of head, neck, and trunk are always clearly visible; but the tail is very short, and the proportions of the different regions of the body are usually quite different from those which prevail among the Mammalia.

The skull is generally of small size, and its cavity is much smaller in proportion than in the Mammalia. This indicates a smaller brain, and less general intelligence in these animals than in those of the preceding class. The bones forming the skull in birds, become completely united together at a very early period of life, so that the whole of the true skull (*cranium*) usually appears to be composed of a single bony piece without any of those sutures, which, in the Mammalia, mark out the separate bones of which the skull is composed. The facial bones, on the contrary, are generally attached to the skull in such a way as to retain a certain amount of mobility; and this is so great in some species as to give the upper mandible the appearance of being articulated to the cranium. The jaws are prolonged into a beak of variable form, upon the upper surface of which, near the base, the nostrils are almost invariably situated; the internal partition between these is sometimes deficient, when the nostrils appear to form a narrow horizontal slit or passage, leading from one side of the beak to the other. The jaws bear no teeth, but are covered with horny sheaths, the form of which varies remarkably, according to the nature of the food upon which the creature is destined to subsist. The orbits, which are always placed laterally, are seldom completely closed; the partition separating them is often perforated (fig. 140). Beneath them on each side runs a slender process of the upper jaw, called the *jugal bone*, which passes backward until it reaches a small bone springing from the hinder part of the skull on each side close to the ear; these, which are called the *tympanic bones*, furnish the points of articulation for the two branches of the lower jaw. The occipital bone, situated at the lower part of the back of the skull, exhibits a large aperture for the passage of the spinal cord, and a single condyle or tubercle for the articulation of the skull with the first vertebra of the neck. This condyle is always very convex, and sometimes nearly globular—a structure which gives to the heads of these animals a great range and facility of movement.

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* The foot-prints of birds occur in the new red sandstone, the earliest of the secondary formations, both in Europe and America. They are accompanied by similar traces of gigantic Batrachian reptiles.

* Although it is by no means certain that the air pervading the body of the bird by means of these air-sacs, is in any way subservient to respiration, it is impossible not to recognize in this provision for the passage of air amongst the tissues of the body an analogy with that arrangement of the respiratory apparatus in insects, which, in like manner, serves to render the bodies of those animals sufficiently light to enable them to exercise the power of flight. In this, as in some other respects, the analogy between birds and insects is unmistakable.

The neck in birds is of greater average length than in mammals, and even in those species which apparently have a short neck when clothed with feathers, the cervical region of the skeleton is usually much elongated. The number of vertebræ is never less than nine; but most birds have from twelve to fifteen of these bones in the neck, whilst some have upwards of twenty. The neck is longest in some of the aquatic birds, such as the swans and flamingoes; the neck of the swan has twenty-seven vertebræ. The bodies of the vertebræ present a convex surface behind, and a concave one in front, an arrangement which gives great freedom of motion; and in most birds we find the neck capable of describing very sharp curves, whilst the strong lateral processes of the vertebræ furnish sufficient points of attachment for the muscles which support the neck in its different positions, and enable the bird to dart its head rapidly forward in order to capture its prey.

Of the dorsal vertebræ there are usually from eight to ten; but some birds have only six of these bones, while others have as many as eleven. They are generally short and very firmly attached to each other, so as to form a solid column; great firmness being requisite in this part of the body, in order to give a proper support to the wings. In some cases, indeed, the dorsal vertebræ are anchylosed. They are furnished with spinous processes both above and below; the latter serving to give attachment to the lungs, which, as already stated, are affixed to the inner surface of the chest. They are also provided with transverse processes for the articulation of the ribs, which present two articulating surfaces—one of which is applied to the body of the vertebra, and the other to the transverse process. The ribs are flat bones composed of two parts, united by a movable joint (fig. 135); the upper part which articulates with the vertebral column is the true rib; the lower, which is attached to the edge of the sternum, is analogous to the sternal cartilage in the Mammalia. It is by this arrangement that the movements of the chest, necessary for the inspiration and expiration of air, are performed. From the posterior surface of each true rib, at a variable distance from its base, there springs a *laminar process* of greater or less length, which projects backwards and upwards, so as to overlie the succeeding rib just above its laminar process (fig. 134). The object served by these processes is that of furnishing an additional bond of union between the different ribs, so that the whole framework of the chest acquires a great degree of firmness. The processes are very large in birds possessing great powers of flight (such as the hawks), whilst in those which are not remarkable for this faculty they are usually of small size, or even rudimentary (see fig. 135).

The sternum, which completes the bony framework of the chest, is a large, more or less triangular bone, concave internally and usually very convex externally, where it is also furnished with a large crest or keel, serving to give attachment to the enormous pectoral muscles, by which the wings are made to strike downwards upon the air. In birds noted for a very powerful flight, this keel is of great size, as might be anticipated; whilst, in the ostrich and some other birds whose wings are so small as to be incapable of raising them into the air, the sternal keel is entirely deficient. The edges of the sternum, as already stated, give attachment to the sternal ribs; at its anterior part it is provided with articular surfaces for the reception of some bones connected with the wings, to which we shall have to allude further on.

The lumbar vertebræ, which in the Mammalia always retain a certain amount of mobility, are here completely amalgamated together, and with the sacral vertebræ, form a single piece to which the pelvis is attached. The latter is greatly elongated, advancing so far as often to conceal a portion of the last ribs (see figs. 135, 136); but its inferior arch is not closed, as is the case in the Mammalia. The only known exception to this rule is to be found in the African ostrich. The posterior limbs are articulated to the sides of the pelvis by a ball and socket joint, as in the mammals. The sacral vertebræ are succeeded by those of the short tail, which are of small size, and vary from six to nine in number. The last vertebra is usually larger than the others, and often placed so as to rise perpendicularly to the axis of the body; it is to this that the muscles for moving the tail are attached.

Having shown above how the framework of the chest in birds is arranged, so as to give it the firmness necessary to bear the strain thrown upon it in the action of flight, we may now proceed to the consideration of the structure of the wings, and the mode in which they are supported. From the articular surfaces already mentioned as existing on the anterior part of the sternum, there spring two large and strong bones, which are directed upwards and forwards, at the same time diverging more or less from each other. These are the *coracoid bones*, which, in the Mammalia, with the exception of the monotremata, are reduced to a rudimentary condition, and anchylosed to the upper part of the shoulder-blade. The superior part of each coracoid bone is furnished with an articular surface, which assists in the formation of the shoulder joint. The remainder of this socket is formed by the extremity of the scapula or shoulder-blade, which rests against that of the coracoid bone. The scapula is usually elongated and rather slender, and is applied upon the dorsal surface of the ribs, where it lies nearly parallel to the vertical column. From the position and strength of the coracoid bones, they are evidently well adapted to furnish firm points of support for the wings; but they are further assisted in this office by the clavicles or collar bones, which are usually anchylosed to each other in the median line, so as to form a single V-shaped bone called the *furculum*.* The other extremities of the clavicles are articulated to the inner surfaces of the superior extremity of the caracoid bones, to which they serve as supporting buttresses, and thus assist materially in resisting the action of the powerful muscles of the wings. The bones of the wings themselves are easily recognized as corresponding with those of the anterior members in the Mammalia. The humerus, or arm-bone, is a long cylindrical bone articulating with the shoulder-blade and coracoid by a ball and socket joint, and presenting at its lower extremity a double articular surface for the reception of the two bones of the fore-arm. The latter are usually longer than the humerus, cylindrical in form, and thickened at the two extremities; but one of them—the *ulna*—is always much stouter than the other—the *radius*—which is generally very slender. The carpal bones forming the wrist, are two in number, small, and rounded. They are followed by two elongated metacarpal bones of unequal thickness, which are completely anchylosed together at both ends. At the base of these, on the outer edge, we find another small bone, which is sometimes free and sometimes anchylosed to the metacarpal (fig. 137). This is the rudiment of a thumb, and gives support to a few feathers, forming what is called the pinion or bastard-wing. The metacarpal bones are followed by the phalanges, which usually represent two fingers, one of which is composed of two or three joints, the other only of one. These phalanges are endowed with but little mobility, so that the whole wing may be regarded as composed of three joints, united by a more or less hinge-like articulation at the elbow and wrist. By this arrangement the wing is rendered stiff when extended, whilst, at the same time, its three joints lie nearly parallel to each other when the wing is contracted, and thus occupy a very small space.

The structure of the hind limbs corresponds, in like manner, with that of the same members in the Mammalia. The femur, or thigh-bone, is usually short and stout, and articulates with the pelvis by a ball and socket joint, the rounded head being set on, as in the mammals, nearly at a right angle to the axis of the bone (see fig. 135, Plate 36). This is followed by the tibia, or shank-bone, usually much longer than the thigh, and accompanied by a slender fibula. This latter bone is, however, commonly attached to the tibia, and it always becomes gradually attenuated towards the apex, and disappears entirely long before reaching the extremity of the shank. The knee-joint is furnished with a small knee-cap, or *patella*. The tarsus also consists of a single cylindrical bone, often of great length; and the foot is terminated by from two to four toes containing a variable number of joints. The usual number of toes, especially in the most typical birds, is four; and of these one is generally directed backwards.

Of the muscles by which the apparatus of bones just described is set in motion, we need say but little. They are generally very firm, and of a deep-red colour. The principal mass of the muscles is devoted to the movement of the wings. These, of course, vary in bulk according to the power of flight possessed by the bird, and correspond with the development of the sternal keel. The muscles of the thigh and shank, are also largely developed, and it is in the hinder limbs also that we find the sinews presenting most distinctly those peculiarities which characterize them in birds. They are exceedingly white and glistening, and have a great tendency to become ossified. The long tendons which pass down the back of the tarsus from the flexor muscles of the toes, are especially remarkable in these respects. They are of the greatest importance to the bird in perching; indeed, it is to this peculiar arrangement that the bird is enabled to perch. Passing over the back of the heel, like a cord over a pulley, they are necessarily stretched by the flexion of this joint, caused by the weight of the body in the act of perching. They thus exercise a sort of involuntary action upon the toes, causing them to grasp any object with great firmness, and thus retaining the bird securely in its position even during sleep.

It is hardly necessary to say that the clothing of the skin in these animals consists of feathers, a circumstance from which de Blainville proposed to name the class *Pennifères*. It may be as well, however, to give a few details of the nature of these tegumentary appendages, which, although somewhat analogous to the hairs of the Mammalia, are of a far more complicated structure.

A feather ordinarily consists of two distinct portions —a central *shaft* or *stem*, and a pair of *webs*, occupying the two sides of the shaft, and composed of numerous flattened fibres or *barbs*, closely applied to each other. The basal portion of the central stem, which is partially inserted into the skin, is a hollow, horny tube, usually transparent, and terminating in a more or less pointed or rounded extremity. The upper portion forming the true shaft of the feather, is solid, and composed of a white spongy substance coated with a horny sheath. It tapers gradually to the extremity; its lower surface exhibits a strong groove, whilst its upper horny surface is usually rather convex, smooth, and continuous at the base, with the tubular portion of the feather. At the point where the upper horny sheath wrapping round the sides of the stem forms the origin of the hollow quill, there is usually a second small stem, also furnished with webs. This, which is called the *plumule*, is not found in all birds, and where it does occur, is always confined to the soft feathers forming the clothing of the body; the quill feathers of the wings and tail being destitute of it.

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* This is the well-known *merrythought*, with the ceremony of breaking which most of our readers are probably acquainted.

The sides of the shaft are occupied by the webs, composed, as already stated, of numerous flattened fibres or barbs. These are inclined towards the apex of the feather. They are usually concave in front and convex behind; so that they fit together very closely, and their mutual adhesion is provided for by the agency of a series of minute secondary fibres, or *barbules*, which spring from their margins. These characters are not, however, common to all the barbs even of the same feather. The lower barbs are usually soft and disunited, forming the substance well known as down, and in many of the feathers clothing the body this downy portion constitutes the principal part of the feather, the tip only being formed by a few stiff barbs. The accessory plumule, where it exists, is always of a downy nature, and in a few species of birds the whole plumage shows a tendency to acquire a similar structure. The skins of many birds, especially of the aquatic tribes, are also clothed, beneath the ordinary covering of feathers, with a thick coat of down, which, although evidently analogous in its nature to the true feathers, yet exhibits certain peculiarities deserving of special mention. The down consists of a multitude of minute tubes inserted into the skin, from the extremity of each of which there arises a little tuft of soft, disunited filaments. These may evidently be regarded as the barbs of a shaftless feather, and they are furnished on each side with numerous minute fibres representing the barbules.

In all birds the feathers are changed once or twice in the course of the year, the old feathers falling out by degrees, to be replaced by new ones. This process is called *moulting*. In it, as in the first clothing of the bird with its feathers, these organs are formed in small tubes in the skin, lined by a duplicature of the epidermis. A peculiar fluid secretion is produced at the bottom of each tube; this is soon inclosed in a delicate, conical, horny sheath, with its point directed outwards; and within this sheath the formation of the feather goes on. As the latter increases in size, the point of its sheath is extended towards the surface of the skin, from which it finally issues, and then, bursting, allows the inclosed feather to make its escape. The portion of the formative fluid remaining in the quill after the feather has attained its maturity, is gradually dried up within the cavity, where it forms that peculiar membranous substance which every one must have observed in the quills destined for use as pens.

In the bats, the only forms of mammals which are endowed with the power of flight, the function is performed, as has already been stated, by the agency of broad membranes, which, when they are extended by the elongated fingers, constitute admirable organs for aerial locomotion. In the bats, also, the tail is usually provided with a membrane of greater or less extent, which is of great service to these creatures in directing their course through the air. In birds the same purposes are fulfilled in a very different manner, but still by an extension of the tegumentary appendages. The structure of the anterior member in a bird, as already described (see Plate 36), is very different from that of the same part in a bat. For all practical purposes, the region of the hand may be regarded as reduced to a single finger, so that the limb forms a single series of long joints placed end to end. But the feathers implanted in the skin of these members are of large size and firm texture, and so arranged that when the wing is extended they spread out like the rays of a fan, so as to expose a broad surface to the air; whilst by the mode in which they mutually assist each other, and their own proper elasticity, their power of resistance is very considerable. At the same time, when the wing is closed, they pack together into a comparatively small compass, and are thus no impediment to their owner in moving about upon the ground or in trees.

As the number, form, and arrangement of the quill feathers of the wing are of considerable importance in the classification of birds, ornithologists have found it necessary to give them different names, according to the region of the wing upon which they are situated. The longest and strongest, and consequently those which have the most influence upon the power of flight possessed by any bird, are the feathers inserted upon the hand; these are called *primaries*. They usually decrease in length from the outer margin of the wing, and in this case the wing is more or less pointed in its outline; in other cases the longest feather is the fourth or fifth, when the apex of the wing becomes more or less rounded. Their number is usually nine or ten, and sometimes eleven. The name of *secondaries* is given to the feathers attached to the middle division of the anterior limb, corresponding with the fore-arm of man; these are shorter and weaker than the primaries, and vary far more in their number. The *tertiaries* are the feathers attached to the arm. A few small quill feathers attached to the rudimentary thumb, form what is called the *alula*, or spurious wing, and the bases of all the quills are concealed by numerous large but comparatively soft feathers, forming the *wing-coverts*, which are distinguished as primary and secondary, according to their position.

The quill feathers of the tail, like those of the wings, are long and stiff; they are furnished with muscles, by which they can be spread out to catch the air or contracted within a small compass, and by the motion of the tail itself they may be turned in various directions. Hence, from their serving in some sort as a rudder for the bird in its aerial course, they have been termed *rectrices*; the quills of the wings being also known as *remiges*, from their being the main instruments of propulsion. The bases of the tail feathers are concealed, like those of the wings, by softer feathers, forming *coverts;* these are usually of moderate or small size, but sometimes attain an extraordinary degree of development.

It seems almost unnecessary to indicate the beautiful adaptation of the covering of birds to their habits and mode of life. Organized as they are for the most rapid passage through the air, their numerous feathers, lying one over the other and all directed backwards, offer no impediments to their flight; whilst, at the same time, the very pressure of the atmosphere, as the bird pursues its swift course, will only cause the feathers to lie more closely, and thus present an increased obstacle to the penetration of the cold air to the skin of the bird—a circumstance of no small importance when we consider the high temperature of the bodies of these creatures. The downy coat which everywhere intervenes between the external feathers and the skin, is an additional protection against the influence of cold, especially by giving room for a certain quantity of warm air, the escape of which is prevented by the outer feathers. The structure of all the feathers, even those of the wings and tail, renders them very light, a necessary condition for animals whose principal activity is in the air. In the aquatic birds a further provision is necessary; the feathers of these must resist the passage, not only of air, but of water. For this purpose they are found to be constantly lubricated with a peculiar oily secretion, which renders them perfectly waterproof; it is obtained from a peculiar gland situated on the tail, which the birds press with their bills when cleaning and arranging their plumage.

In most birds the whole surface, with the exception of the bill and feet, is clothed with feathers, but a few have the head, or even the head and neck, quite bare. In most of these the skin is folded so as to form wrinkles or wattles, which are often adorned with the most brilliant colours.

The horny bill or beak which incloses the jaws of all birds, is usually of a more or less conical form; but this is modified almost infinitely to suit the requirements of the different species. Thus, in the hawks or other predaceous birds, the upper mandible of the bill is strongly hooked at the tip, and many of the species possess a tooth on each side at some little distance from the apex; the parrots possess a strongly hooked bill, which assists them in climbing; the wading birds are often endowed with long bills, adapted for the capture of their food in mud and water; and the ducks have a more or less flattened bill, fringed along the margins, and admirably fitted for straining their food from the soft mud in which it is often found. All these and many other variations in the form and structure of the bill, will, however, come under our consideration hereafter, in describing the characters of the different species of birds, so that it is unnecessary to dwell upon them any longer here. The *cere* is a naked skin, clothing the base of the bill in many birds, and inclosing the nostrils.

In the structure and clothing of the feet, we find characters of perhaps equal importance with those presented by the bill and wings. The number of toes is usually four, and of these three are commonly turned forwards, and one—the great toe—backwards. In some of the waders and aquatic birds, the hind toe is entirely wanting, as it is also in the ostriches; the true, or African ostrich, is also destitute of one of the front toes, so that it has but two in each foot. In the parrots and woodpeckers, and some other climbing birds, the outer toe is directed backwards as well as the great toe, so that there are two each way—(see fig. 134)—and the cuckoo has the power of turning the outer toe either backwards or forwards at its pleasure. The swifts have all the four toes turned in one direction. In most birds the toes are united at the base by a small fold of skin or web, which is generally insignificant, but often shows itself very distinctly. In the true water birds, these webs attain a much larger development, generally uniting the anterior toes quite down to their tips, and in some cases even extending back along the inner margin of the foot to the hinder toe.

In a few birds, of which the eagle is one, the clothing of feathers extends down to the very toes, but in the majority the whole foot, from the heel downwards, is quite naked, and in some of the waders and water birds this naked part even extends for some distance up the shank. The skin of the foot is of a horny texture, sometimes scaly or granulated, sometimes divided into distinct horny plates of larger or smaller size. The toes are always terminated by claws, the form of which, like that of the bill, usually furnishes a good clue to the habits of the animal. Thus, in the predaceous species we find the claws long, strong, sharp, and curved, forming most formidable weapons; the smaller granivorous and insectivorous birds are also usually provided with long, curved claws, but these are slender and weak, and only of service to them in clinging to the surfaces of objects. Those species which, like the pheasant and our common fowl, find much of their food by scratching in the earth, are furnished with stout nail-like claws; and these organs become still more nail-like in many of the aquatic birds. In the pheasant family, the male birds are frequently furnished with one or more spurs or accessory claws, attached to the back of the tarsus, at some little distance above the hinder toe.

In their internal structure, birds present much resemblance to the Mammalia; they possess the same organs, arranged, with one or two exceptions, nearly in the same manner, and the vital operations are carried on by precisely the same means in both these great classes. The principal difference in the structure of the digestive organs consists in the dilatation of the œsophagus, or gullet, into a spacious bag called the *crop*, in which the food is retained for some time after being swallowed. The walls of this bag contain a great number of glands, the fluid secreted from which soaks the food, and thus fits it for the action of the true digestive organs. The true stomach is separated from the crop by a continuation of the œsophagus, furnished with very thick, glandular walls. The office of these glands is to secrete the gastric juice; and the stomach itself, in those birds which feed on hard substances, such as seeds, is very muscular, and lined internally with a hard coating, which materially assists in the trituration of the food. This stomach is well known as the gizzard.

The brain in birds is proportionally smaller than in the Mammalia, indicating a lower degree of general intelligence. The organs of the senses, also, are for the most part less perfect than in the Mammalia, and the sense of touch especially must generally be possessed by birds in a very low degree. The eyes, however, are usually of large size and well formed, although, as they have but little power of motion in the orbits, these animals are under the necessity of turning their heads to bring into view any objects at which they desire to look. This peculiarity is induced by the form of the eye, which is of a very large size, and of a more or less flattened form, but bearing in front a narrowed portion, the surface of which is occupied by the cornea. Around this narrowed portion of the eye we find a curious ring of small bony plates imbedded in the sclerotic coat, and hence known as the sclerotic plates. The office of these plates, which are connected with delicate muscular fibres, is to increase or diminish the convexity of the cornea, according as the ring which they form is contracted or dilated by the action of their muscles, and thus adapt the visual power of the eye to the varying distances of objects.

The organs of hearing are, next to those of sight, the most highly developed in birds; but they are never furnished with an external ear, such as we see in most Mammalia. The ears open on the sides of the head, behind the eyes; they are usually surrounded by a circle of feathers, which, to a certain extent, takes the place of an external ear, and within these the tympanic membrane may be easily seen stretched across the bottom of a short passage. In the owls and other nocturnal birds, the ears are of great size.

The organs of smell are but imperfect in their construction; the internal cavities possessing but few of those convolutions, clothed with a delicate mucous membrane amply supplied with nerves, which exist in most mammals. The nostrils are nearly always placed on the sides of the bill, or at its base; the only exceptions to this rule being presented by the species of the singular genus *Apteryx*, which is peculiar to New Zealand. In many birds with the nostrils placed near the base of the bill, these apertures are pierced in a naked skin, called the *cere*. The sense of taste appears to be exercised by most birds in even a still lower degree of perfection than that of smell, for the tongue is usually of a horny texture, and it is only in the parrots and a few other birds that we meet with a fleshy tongue.

The reproduction of birds is effected, as previously stated, by eggs; and they are, in fact, the only class of vertebrate animals in which nothing approaching a viviparous reproduction ever takes place. The Mammalia are all strictly viviparous, and therefore out of the question here; but, amongst reptiles and fishes, we meet with many instances in which the eggs are hatched within the body of the mother, whilst the eggs of birds are invariably excluded, inclosed within a hard calcareous shell.

The young birds are, as is well known, usually hatched by the warmth of the body of their parents; the latter sitting upon the eggs during the whole time that the development of the embryos is going on within the shells. In this occupation, which is denominated *incubation*, both sexes frequently take part; but, in many instances, the whole of this labour devolves upon the female. The number of eggs laid by a hen-bird varies greatly in different species; some lay only a single egg; most of the rapacious birds lay at least two, whilst the smaller birds are far more prolific, some of them depositing sixteen or eighteen eggs in a single brood. After the young birds are hatched, the parents attend to their wants and safety for a considerable time; but the amount of labour thus entailed upon them is very different in different groups of birds, owing to variations in the condition in which the young birds leave the egg. In all the birds whose chief scene of activity is the air; that is to say, in those groups which are most distinguished by the power of flight, and which dwell amongst the branches of trees, or in other elevated situations, —the young are hatched in a very helpless condition; and for some time after they come into the world are wholly dependent upon their parents, not only for protection from danger, but for the nourishment necessary for their further development. In the land and water birds, on the contrary, the chief activity of which consists in running or swimming, the young birds are usually capable of accompanying their parents from the time of their leaving the egg; and in these, therefore, the principal duties of the latter consist in conducting their progeny to the places in which food is to be found, and in sheltering them from the perils to which, in their comparatively helpless state, they are exposed. Hence it has been proposed to divide all birds into two primary groups—the *Autophagæ* or *self-feeders*, in which the young can provide for themselves from the first; and the *Insessores* or Perchers (so called from the ordinary habits of the majority of the species), in which the young require to have the food brought to them by their parents. Unfortunately, this rule does not strictly hold good, as regards all the members of the former group; for the young of many of these are for a long time wholly dependent on their parents.

There are two other phenomena connected with the general history of birds, to which we must briefly advert in this place. The first of these is intimately connected with the subjects that we have just been considering; this is their nest-building, or *nidification*, as it is usually termed. Almost all birds form a nest of some kind for the reception of their eggs during the period of incubation; and, in those species whose young are hatched in a perfectly helpless condition, this also serves as a cradle for the callow brood during their infancy. The materials of which the nest is composed vary greatly; but the individuals of each species usually exhibit a most remarkable uniformity of choice in this respect. Very few, and these are all of the autophagous section, content themselves with a hole scraped in the ground in some sheltered situation; and even of these the majority take care to line the bottom of the cavity with a few leaves, or other materials, to protect the eggs from the coldness of the ground. Some birds, such as the parrots and woodpeckers, lay their eggs in the holes of trees, which, however, they generally enlarge considerably to suit their purposes by means of their bills; and the chips produced during this operation serve as a soft layer for the reception of the eggs. Other birds which take up their abode in similar situations, bring in soft materials to line the bottom of their wooden nest. But most of the true nest-building birds bring together a quantity of materials of various kinds, sticks, twigs, straws, moss, wool, feathers, &c., which they either lay together in a mass amongst the branches of the trees, or on the surface of a rock, or interweave in a most ingenious manner to form a more or less cup-shaped nest; the finer and warmer materials, such as wool and feathers, being always employed in lining the interior. A few species, such as the swallows, compose the exterior of their nests of mud, and line them with softer materials. The beauty and ingenuity of construction of many of these little edifices, to which we shall have to advert hereafter, are such as must excite the highest admiration in every intelligent observer. In this respect, they resemble the wonderful architectural labours of many insects, and thus furnish an additional indication of the analogy already mentioned between these two classes in their respective sections of the animal kingdom. In both we find the highest development of the instinctive faculties in their respective grades; for it is to be observed that both the bird and the insect always build in one particular fashion; every edifice produced by individuals of a given species, exactly resembling those formed by its brethren both in structure and materials, except where accidental circumstances, easily traced, may now and then cause a slight deviation from the ordinary mode of proceeding.

The second phenomenon above alluded to is an illustration of instinct perhaps almost more puzzling than the nidification of birds; it is their periodical migration from one country to another. Every one is aware that great numbers of our common birds only reside with us during a portion of each year: some visit us in the autumn, and stay in Britain during the winter; others arrive in the spring, and leave our shores in the autumn. The winter visitors come from more northern, and the summer ones from more southern regions. The latter are for the most part insectivorous birds; and we can easily understand that, although, during the summer, they may find an abundant nourishment about our fields and woods, they would be but ill off when the severe weather of winter sets in. The winter visitors are principally granivorous small birds, or aquatic species, whose nourishment would be equally cut off by the intense frosts of the high northern latitudes, where they have their abode in the summer. Thus we may easily understand the reasons for this great change of dwelling on the part of our feathered visitors; but we must not the less wonder at the marvellous instincts which prompt whole species to undertake a long and arduous journey over sea and land at certain definite periods of the year, prompting them even long before there is any apparent necessity (to our observations) for their departure, to wing their way to distant climes.

It will be unnecessary to enter into any historical account of the different classifications of birds, such as we thought it desirable to give in connection with the Mammalia. Naturalists are pretty generally agreed as to the limits of the orders composing the present class; and we shall therefore confine ourselves here to the following tabular view of the classification that will be adopted in the present work. The sectional names—Autophagæ and Insessores—have been retained in this table, rather as indicating the general habits of the species included in the orders placed under them, than as being strictly parts of the classification.

SECTION I.—INSESSORES.

ORDER 1. ACCIPITRES.—Bill much hooked, with a cere at its base; feet strong; claws strong, and much hooked.
" 2. PASSERES.—Bill variable in shape, without a cere; toes three in front, one behind.
" 3. SCANSORES.—Bill variable in shape; toes two in front, two behind.
" 4. COLUMBÆ.—Bill slightly arched, with a soft tumid membrane at the base of the upper mandible, in which the nostrils are pierced; toes three before, one behind.

SECTION II.—AUTOPHAGÆ.

ORDER 5. GALLINÆ.—Bill arched above, with the edges of the upper mandible overlapping the lower; toes three before, one behind (or hind toe wanting) not united by a membrane; legs feathered to the heel.
" 6. CURSORES.—Wings rudimentary; legs strong; hind toe wanting.
" 7. GRALLÆ.—Wings well developed; legs long; tibiæ not feathered to the heel; toes three in front, one behind (or hind toe wanting) not united by a membrane.
" 8. NATATORES.—Feet webbed; legs placed very far back.

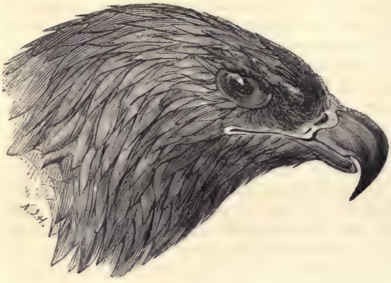
ORDER I.—ACCIPITRES.

THE Accipitres or Rapacious Birds, the Raptores of Cuvier, have been placed by almost all naturalists at the head of their class; and in this we shall follow preceding authors, although, in point of intelligence, as also of analogy with the mammalia, the parrots ought perhaps to occupy this honourable position. This order includes those birds which are more especially adapted to a strictly predaceous mode of life, and which display their fierce and destructive nature in their tremendous muscular power, and the formidable weapons with which they are furnished.

It is, as already stated, in the structure of the bill and feet, that we look for those characters which stand in the most intimate relation to the mode of life of the bird. The bill is short, strong, and hooked; that is to say, the upper mandible is always much longer than the lower one, and either more or less curved throughout its whole length, but more especially at the tip, or else nearly straight in its basal portion, and strongly bent down at the apex. The lateral margins of the upper mandible are often armed with one or more teeth, not like those of the Mammalia, but simply acute projections of the horny covering of the mandible; its base is always covered by a naked leathery cere, in which the nostrils open.

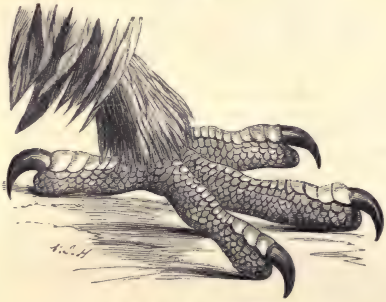
This bill, with its acute tip and sharp and often jagged edges, is admirably adapted for tearing to pieces the prey upon which these birds subsist; and the structure of the feet and claws fits them no less admirably for seizing the victim and holding it fast, while the relentless beak is engaged in its destructive work. The feet are generally short and very powerful, and terminated by four strong toes, covered beneath with roughened pads. The claws with which these toes are armed, are of enormous size and strength, very acute at the tip, and furnished with two sharp edges. This is especially the case in the most predaceous species; but, in those which feed on carrion and in some of the smaller species which prey upon insects, the power of the feet and claws, as also that of the bill, is naturally much diminished.

Fig. 94.



Head of the Golden Eagle.

Fig. 95.



Foot of the Golden Eagle.

In accordance with the indications furnished by the bill and feet, we find the whole organization of the bird eminently fitted to sustain it in the continual warfare which it wages with nearly all the rest of the animated creation. The wings are of immense extent, and moved by most powerful muscles; the keel of the sternum being excessively developed to give attachment to those which draw the wings downwards. Their flight is accordingly powerful; and many of the species cut their way through the air with the most astonishing rapidity; the ordinary rate of progress of some being calculated at about sixty miles an hour. But even this rapid motion is greatly exceeded under circumstances of excitement; for, in pursuit of their prey, some falcons are supposed to rush along at the rate of at least a hundred and twenty miles in the same space of time. The tail also is long and composed of strong feathers, so that it forms a most effective rudder to direct the movements of the birds in their rapid course.

The covering of the feet is usually a reticulated or scaly skin; and it is only in a few species that we find any portion of the foot covered with shield-like plates. In some, however, the tarsi are clothed with feathers quite down to the origin of the toes. The toes are always four in number, and placed three in front, and one behind. The anterior toes are usually united by a fold of skin at the base; but in the owls this small membrane only occurs between the inner and middle toes, and the outer toe is capable of being turned backwards.

The birds of this order vary greatly in size, and in most cases the male is considerably smaller than the female. They live in pairs during the breeding season, and both the male and the female assist in the construction of the nest, in the task of incubation, and in the bringing up of the young. They are found in all climates, from the coldest to the hottest, and only the species of one family are confined to the warmer regions of the earth.

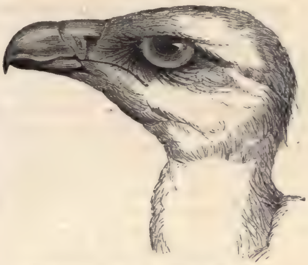
The accipitres are usually divided into three families, the *Vulturidæ* or vultures, the *Falconidæ* or hawks, and the *Strigidæ* or owls; the latter also constitute the section of *nocturnal* birds of prey, the principal period of activity being the evening and night; the other two families are called *diurnal* predaceous birds, as by far the greater part of them are never abroad except by day.

FAMILY I.—VULTURIDÆ.

In the Vultures the bill is considerably more elongated than in the other families of predaceous birds, and often comparatively slender in its form; its basal portion is always straight, and the tip rather suddenly hooked. The lateral margins of the upper mandible are often sinuated, but never toothed. The head—(fig. 96)—is usually naked, and the neck also frequently partakes of this character; in many cases the head is furnished with peculiar wattles, and the skin, both of this part and the neck, is sometimes adorned with brilliant colours. The eyes are placed on the sides of the head, without any projecting eyebrows above them; the wings are very long and pointed; the feet are covered with reticulated scales; the middle toe is very long, the hinder one rather elevated, and the whole are armed with stout but rather blunt claws.

These birds, as may be easily seen from their characters, are by no means the most predaceous of their order; on the contrary, most of them hardly deserve the title of predaceous birds, as they rarely attack a living prey, but content themselves with feeding upon the flesh of such animals as have already died. Their favourite food, in fact, is carrion, in the midst of which they revel in a state of the highest enjoyment, often gorging themselves to such a degree with this savoury banquet, that they become utterly incapable of flight. From the nature of their diet they also acquire an abominable odour; and taking these facts into consideration, it is hardly to be wondered at that most people feel a certain degree of disgust associated with the idea of a vulture. But in the hot countries frequented by these birds, they are viewed with very different eyes; there their mission as scavengers is recognized. They are seen pouring down in flocks upon an abundant supply of their favourite food, and soon clear away every vestige of animal matter, even from a large carcase; thus preventing those pestilential effluvia which would speedily emanate from a mass of animal matter exposed to the tropical sun, and poison the air in its vicinity. Viewed in this light, the vultures must be regarded as benefactors of the human race in the countries frequented by them, and in most oriental cities they combine, in their own proper persons, the offices of inspectors and removers of nuisances. Under any circumstances, the vultures are certainly undeserving of the opprobrium that has been heaped upon them even by professed naturalists, such as Buffon and his followers, whose statements have still some influence upon the popular mind. It is true, that if we apply to the characters of animals the moral tests that we employ in discriminating those of our fellows, the vultures may be called cowardly, lazy, and gluttonous, and the eagles may be magnified into models of courage and nobleness. But this is hardly fair, for each of these birds is equally fitted for its peculiar sphere of activity. The vulture feeding on carrion, and even preferring this to freshly-killed meat, is not likely to exhibit much of what is called courage in attacking other animals, and in devouring as much as he can at once, he is but fulfilling his instincts; and on the other hand, when we calmly investigate the so-called courage of the eagle, we find it hardly so great as is commonly supposed, for scarcely any of the animals that he attacks have the least power to defend themselves against his terrific talons.

Fig. 96.



Head of the Tawny Vulture (Gyps fulvus.)

It has long been a question amongst ornithologists whether the vultures discover their food by the sense of smell or by that of sight; and the older writers on natural history generally assumed that it was by the former of these senses that the birds received the first indication of the presence of their favourite nourishment. Probably they were led to this conclusion rather by the well known odorous properties of the delicacies in question than by any other consideration; and it must be confessed that this solution of the matter seemed perfectly natural. It is now, however, a good many years since some ornithologists ventured to raise a doubt as to the accuracy of this view, denying that the vultures were endowed with the sense of smell in a sufficiently high degree to account for their perception of carrion at a distance, and urging the claims of the sense of sight to the honour of guiding these birds to their food. The controversy was carried on with a vehemence which soon left the ordinary amenities, supposed to prevail amongst philosophers, at a distance; and it seems now to be established, in opposition to the older writers, that it is really by the sense of sight, at all events in part, that the vultures discover their food. Thus it has been found, that when the body of an animal, even in an advanced stage of putridity, is concealed by a covering of any kind, the vultures do not come near it; but as soon as the covering is removed, they descend upon the carcass and speedily devour it. It is also said that a carcass may lie untouched in a similar manner under the trees of the forest, although the vultures may frequently sail over the spot; whilst the same object could scarcely lie for a few minutes in the open country without being surrounded by numerous devourers. These facts seem to show indubitably, that it is to acuteness of vision that the vultures are usually indebted for earliest intelligence of a feast in prospect.

Amongst the vultures, as in the monkeys, we find that the members of the family inhabiting the two hemispheres are distinguished by certain peculiarities coinciding with their geographical distribution. One of the most important of these consists in the structure of the nostrils, which, in the species inhabiting the Old World, are separated by a partition, so that they appear as mere holes pierced in the cere on the sides of the beak; whilst in the American species the partition is wanting, and the nostrils form an opening from one side of the beak to the other.

THE ARABIAN VULTURE (*Vultur monachus*)—Plate 1, fig. 1—is not, as might be supposed from its name, peculiar to the peninsula of Arabia; its range extends over the whole of Northern Africa, and it also occurs in Persia, India, and several parts of the south of Europe, especially in mountainous districts, such as the Pyrenees, Switzerland, the Tyrol, Hungary, Italy, and Spain. In the Pyrenees it is known by the name of the *Arrian*. We have mentioned it first from its being the type of the genus *Vultur*, as restricted by modern authors, distinguished by having the nostrils round, and the head or neck more or less covered with a short down. The Arabian Vulture is a large species, measuring about four feet in height. The general colour of its plumage is a blackish-brown, but sometimes with an intermixture of tawny; the head is covered with a nearly naked bluish skin, and the neck with a very short down; the latter is surrounded at its base by a frill or collar of long, soft feathers, which also occurs in many other species. The cere is of a violet colour, and the feet greyish. The nest of this bird is built upon the most inaccessible rocks, where it forms a flat mass of sticks, three or four feet in diameter. Upon this platform the female deposits two, or rarely three eggs, which are white, with a very faint bluish tinge.

THE TAWNY VULTURE (*Gyps Fulvus*)—fig. 96, page 237—is another European species, which is met with abundantly in the same situations as the preceding. It appears to be particularly common in Greece, Turkey, and the Grecian Archipelago; but we must remark that, according to some modern writers, the birds found in the eastern and western parts of Europe belong to distinct species. To those inhabiting the Pyrenees, Spain, and Sardinia they give the name of *Gyps occidentalis*; whilst for those found in the mountains of Europe, from Italy eastward, they retain that of *Gyps fulvus*. The differences between the two forms are very slight, the principal distinctive character being derived from the form of the feathers on the lower surface of the body. These are rounded at the tip in the western form, and pointed in the eastern. Specimens, probably of the former, sometimes find their way into this country. The general colour of the plumage in all is tawny, deeper on the upper parts; the head and neck are covered with a whitish down; the nostrils, as in the other species of the genus *Gyps*, are much elongated, and placed perpendicularly to the length of the beak; at the base of the neck there is a frill of long white downy plumes, which gives the bird a singular aspect; the beak is livid, with the tip blackish, and its base is enveloped in a flesh-coloured cere. This fine bird, which is but little smaller than the Arabian vulture, is said to be a summer visitor to most of those parts of Europe in which its occurrence is recorded, retreating at the approach of winter to the African continent, on which, according to Le Vaillant, it even extends its journies as far as the Cape of Good Hope. It feeds, like the rest of its family, upon carrion; and when a party of these vultures has once taken possession of the carcass of a large animal, they are said never to quit it as long as a morsel of the flesh remains, so that they may be seen perched in the same spot for days together. When fully fed, or rather crammed with food, they are quite incapable of flight; and if suddenly disturbed in this happy condition, they are compelled to disgorge the greater part of their banquet before they can rise into the air. They also resort to this process for the purpose of feeding their young, never carrying any portion to the nest in their beak or talons, but throwing up some portion of their own half-digested food to satisfy the cravings of their offspring. When a supply of carrion is not to be had, these vultures are said occasionally to attack living animals. This bird builds, like the preceding species, upon the highest rocks, and forms its nest in the same manner. Its eggs are two or three in number, of a greyish-white colour, more or less covered with reddish spots.

KOLBE'S VULTURE (*Gyps Kolbii*), another species of this genus, which is very common at the Cape of Good Hope, is called *Chasse-fiente* by the French writers, from its habit of devouring ordure as well as carrion. This species also feeds upon molluscs, crabs, tortoises, and even insects.

THE BENGAL VULTURE (*Gyps Bengalensis*) is a smaller species, measuring only about two feet and a half in length; its general colour is brown, with the head and neck pale chestnut, and the bill livid, tipped with black. It is a gregarious bird, flying and feeding in flocks, and also building its nests in small societies among the branches of tall trees. In their habits these birds are very similar to the preceding species, feeding, like them, upon carrion, and gorging themselves into a state of inactivity whenever an occasion presents itself. The recognition of the good service which they render to the public health protects them from disturbance, so that, like licensed scavengers, they are allowed to go about their dirty business without molestation. They consequently lose all shyness but are exceedingly cowardly, giving way to dogs, jackals, and even crows. Notwithstanding their gregarious habits, they squabble exceedingly when feeding; but these quarrels go no further than screaming and hissing, for they seldom or never fight. The nest is described as consisting of a thick mass of branches and twigs, intermixed with dead leaves; the birds appear to lay only a single egg, which is of large size and perfectly white. Lieutenant Hutton, who obtained a young vulture of this species from the nest, found that its progress towards maturity was exceedingly slow. Although it fed greedily it could not stand at six weeks old, and the down did not begin to give place to quill-feathers until it was more than a month old. At two months it was completely fledged. Lieutenant Hutton gives the following account of the manners of this somewhat disagreeable pet:—He says, "It was so tame as to become a perfect nuisance; for no sooner did it see any person than it ran towards them, screaming and flapping its long wings, with the head bent low, and neck drawn in towards the body, often pecking at the feet of the person thus intercepted. Many are the thumps and kicks the luckless bird received from the servants, who most cordially hated him, as their bare feet were often assailed and cut with the sharp blows of his curved beak. Still, through good and evil, he remained with us, roosting at night sometimes on the top of my bungalow, and at others wandering to some of the neighbours. Often did I wish that he would take unto himself the wings of the morn and flee away; for he never entered the house without making it so offensive as to be scarcely bearable."

THE PONDICHERRY VULTURE (*Otogyps calvus*) is another Indian species, greatly resembling the preceding in its habits. It belongs, however, to a different genus, distinguished by having the head and neck quite bare of feathers, and by the skin of the former being curiously folded about the aperture of the ear. The nostrils resemble those of the genus *Gyps* in their position. The plumage of the Pondicherry Vulture is of a blackish-brown colour, with the wings black; the head and neck are flesh-coloured; the crop is surrounded by a longish white down; the beak is blue-black, with a yellow cere; and the feet are yellow.

This species inhabits the same districts as the preceding, and appears to be almost equally abundant with it. It is not, however, gregarious, more than two being rarely seen together. It builds its nest in trees. Although the Pondicherry vulture and the Bengal vulture are nearly of the same size, the former appears to have the power of inspiring some kind of dread in his brother scavenger; for whenever he descends upon a carcass on which a crowd of Bengal vultures are feeding, they immediately make way for him and retire from the banquet until he is satisfied—a proceeding which has obtained for the present species the name of the King Vulture, both from Europeans and natives.

THE SOCIABLE VULTURE (*Otogyps auriacularis*), one of the largest of the species inhabiting the Old World, is an inhabitant of the interior of the Cape of Good Hope, and apparently of the eastern parts of Africa in general, as it is found also in Egypt, Abyssinia, and Nubia. It was discovered in the first-mentioned locality by the celebrated French traveller and naturalist, Le Vaillant, who gives the following account of the first specimen that he met with:—"On the carcass of a hippopotamus," says Le Vaillant, "there was a magnificent vulture busily engaged in devouring it. I had never seen such a large one. When I wounded it, although already gorged with a great quantity of flesh, as its crop contained six pounds and a half when I dissected it, its greediness was such, that in attempting to fly away, it tore off a fragment of its prey, as if desirous of carrying the whole away with it. On the other hand, the weight of the flesh which it had just devoured made it heavy, and prevented it from taking flight easily. We had time to reach it before it flew away, and endeavoured to kill it with the butt ends of our guns; but it defended itself for a long time with the greatest intrepidity, biting our guns or pecking at them with its beak."

This fine bird measures about five feet in length, and its expanse of wing is upwards of eleven feet. Its head and neck are naked and of a reddish colour, tinged here and there with blue, violet, and white; the general plumage is blackish-brown, and the frill surrounding the base of the neck is of the same colour; the feathers of the lower part of the body are crisped so as to exhibit the white down with which the skin is clothed. The beak is horn-coloured, with a yellow cere. The folds of skin on the head and neck are very striking in this species; they commence behind the ears, round which they form a sort of irregular conch; they then pass down the neck for several inches. From this peculiar structure, which is referred to in both the scientific names of the bird, Le Vaillant gave it the French name of *Oricou*, or Eared-neck.

The Sociable vulture is an inhabitant of the mountains, where the numerous caves and fissures furnish it with a good shelter in which to pass the night, or to repose during the day, after a full meal. At sunrise they are seen perched upon the rocks in large bands; and from these stations they soar into the air to such a height as to become quite invisible. But, even at their greatest elevation, they seem still to keep a sharp look out upon the occurrences in the world below them; for no sooner does an animal die than the vultures are upon it, "seeming," as Le Vaillant expresses it, "to escape from a cavern in the sky." If a hunter kill an animal which he cannot remove at once, he will find on his return that the vultures are already busy on its carcase, although a quarter of an hour previously not one was to be seen in the neighbourhood.

This bird builds its nest in the caverns of the rocks; and the different pairs agree so well together, that two or three nests may sometimes be found in the same cave. The female lays two or three eggs which are of a bluish-white colour, with numerous large spots or patches of reddish-brown, especially towards the larger end. During the period of incubation the male birds keep watch at the entrance of the cavern; and the interior presents a most disgusting spectacle, and is infected by an intolerable stench.

THE EGYPTIAN VULTURE (*Neophron percnopterus*)—Plate 1, fig. 3—is a third species which occurs commonly in the south of Europe; but it extends its visits further to the north, having been killed even in Norway. It is especially abundant in Greece, Arabia, and Egypt, but is also met with in great numbers in India, and is stationary all the year round in Spain, Italy, and the south of France. Individuals have also been killed in England. It is the bird popularly known as *Pharaoh's chicken.*

The characteristics of the genus *Neophron* consist in the great development of cere, which occupies two-thirds of the length of the beak; in the elongated longitudinal nostrils; and in the nakedness of the face and throat, while the back of the head and neck are clothed with feathers. The present species is smaller than any of those that we have described, measuring only about two feet and a half in length; its plumage is white, with the extremities of the wings black; the naked skin of the face and throat is yellow, the beak lead colour, the feet yellow, and the claws black.

The Egyptian vulture builds its nest, like the preceding species, amongst the rocks, and lays from two to four eggs of a white colour, but usually more or less spotted with brownish-red. It seeks its food, however, principally in the towns and villages, where it feeds promiscuously with the dogs and jackals on the carcasses of animals and other putrefying filth, which appears to be so peculiarly abundant about the habitations of eastern nations. Its natural appearance is by no means prepossessing, and its plumage is constantly daubed over with the filth amongst which it finds its nourishment; so that it constitutes a most disgusting object to the eye. Nevertheless its useful properties are so well recognized by the inhabitants of the countries in which it principally occurs, that it would be almost a crime there to kill one of these birds; and in Cairo legacies have been left by many wealthy men, for the purpose of providing the vultures, and their brother scavengers the kites, with supplies of fresh meat, in order, no doubt, to induce them to remain permanent residents in the city. This meat is distributed, according to Hasselquist, every morning and evening in the great square where criminals are executed; and here the birds assemble regularly to receive their expected meal. These vultures are also said annually to accompany the caravan to Mecca across the deserts, in order to feed on the offal of the beasts slaughtered, or on the carcasses of the camels which die by the way. In India the bird seems to have exactly the same habits; and Colonel Sykes states that they are always found in cantonments and camps. They pass nearly the whole day on the wing, sailing round in circles. Their efficiency as scavengers is also recognized in India.

THE LAMMERGEYER (*Gypaëtos barbatus*)—Plate 2, fig. 4—which is also frequently called the *Bearded Vulture*, is a remarkable species of this family, forming, both in its characters and habits so striking a transition towards the eagles, that it has even been arranged with the latter by some naturalists, whilst others have constituted a distinct family for its reception. As, however, its most important characters are decidedly vulturine, we have preferred placing it at the end of the eastern vultures.

The principal distinctive characters of the genus *Gypaëtos*, to which the Lämmergeyer belongs, consist in the strong, compressed, and greatly-hooked beak, in the presence of a singular beard-like tuft of stiff bristles under the lower mandible, and of a patch of similar bristles, covering the base of the upper mandible on each side, and concealing both the cere and the oval oblique nostrils which are pierced in it. The tarsi are short and clothed with feathers; and the claws are stronger and more curved than in the other vultures. The head and neck are entirely clothed with feathers.

The Lämmergeyer is one of the largest birds of prey, attaining a length of about four feet, and measuring nine or ten feet in expanse of wing. Individuals have been described exceeding even these dimensions, and measuring from twelve to fifteen feet from tip to tip of the wings. The plumage of the upper part of the body is of a dull brown colour, mixed with grey; the wings and tail are of a greyish tint; the neck, breast, and belly are whitish, more or less tinged with yellow or orange; and the head is dirty white, with a black band on each side. The bristles of the beard and face are also black, as are the claws. These are the general characters of the species; but they are liable to some variation in specimens from different regions, and these have induced several modern ornithologists to describe three or four species of these birds. The distinctions of size and colour upon which they rely for the discrimination of these so-called species, are, however, very slight, and may probably be due to geographical circumstances; we therefore prefer regarding all the northern Lämmergeyers at any rate, as belonging to one species.

This fine bird inhabitants the mountainous regions of Southern Europe and North Africa, and extends its range in Asia to the Caucasus, the Altai mountains, and the Himalayas. In its carriage and aspect it greatly resembles the eagles, as it does also in its habits; for, unlike the preceding vultures, it evinces no liking for carrion, but, on the contrary, prefers its meat fresh-killed. To satisfy this craving, it is endowed with a far more audacious and warlike disposition than the peaceful birds whose characters we have hitherto been considering, and the weapons with which nature has armed it are also of a far more formidable character. It feeds principally upon quadrupeds, such as rabbits, hares, sheep, lambs, and kids, which its powerful beak and talons enable it to overcome easily; and its Swiss name of Lämmergeyer (signifying *Lamb-Vulture*), sufficiently expresses the sense which the Alpine shepherds entertain of its predilection for the tenderer part of their flocks. It is also said sometimes to attack the chamois, or even man himself; but when attempting any such doubtful enterprise as this, it waits until its intended victim is close to a precipice, and then descending upon it with irresistible velocity, sweeps it off into the abyss below. Both in Europe and India stories are current of children being carried off by the Lämmergeyer; but these want confirmation. In the latter country, according to Mr. Hodgson, the habits of the birds approach more nearly to those of the ordinary vultures than appears to be the case in Europe; and they come in flocks to devour carrion of all sorts, without the least regard to the presence of man. The same gentleman tells us that, in the vicinity of Simla and elsewhere on the western hills, the flesh-pots, in which cooking is carried on in the open air, require to be well watched, lest the Bearded vulture steal a share of their contents; and Bruce, in his "Travels in Abyssinia," relates a story of this nature which applies either to this or the following species.

The Bearded vulture builds no nest, but deposits its eggs upon the bare rock; these are two or three in number, of an oval form with one end rather acute; their colour is a bluish-white, covered with smaller and larger spots of reddish-brown and ochreous yellow.

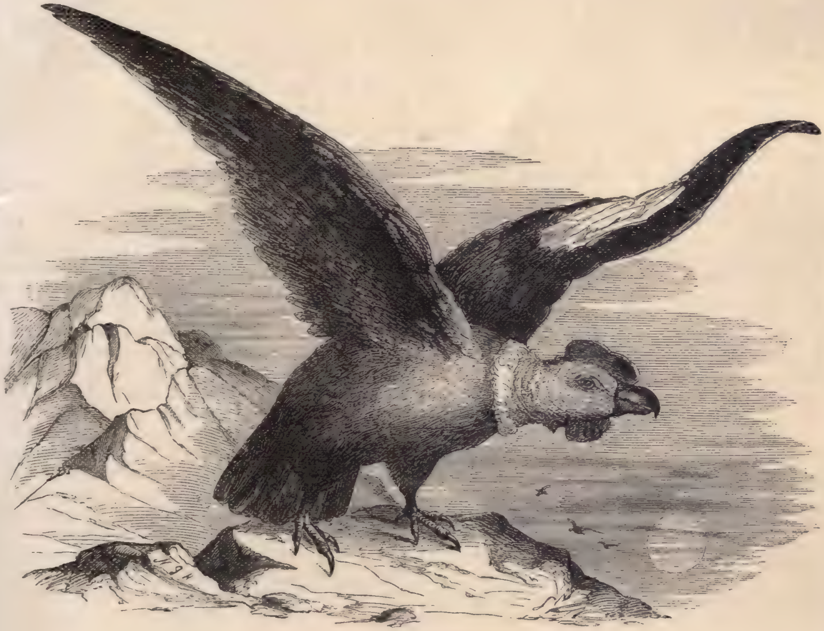
THE AFRICAN BEARDED VULTURE (*Gypaëtos nudipes*) appears to merit being regarded as a distinct species, as the lower part of its tarsi is bare of feathers, a character of more importance than a slight diversity of colour. It is found in Abyssinia, and in the more southern parts of Africa. This is probably the bird alluded to by Bruce, which, he says, is called *Nisser Werk* in Ethiopic, and *Abou Duchir* or Father Longbeard by the Arabs. Bruce gives the following account of the audacity of this bird. While his servants were eating their dinner in the open air on the top of a high mountain, with several dishes of boiled goats' flesh before them, one of these birds suddenly made his appearance. He did not stoop rapidly from a height, but came flying slowly along the ground, and sat down close to the meat, within the ring the men had made round it. A great shout was raised, when the bird slowly retired; but he soon came up again, and was shot within a short distance of the party. Dr. Roth says, that the Abyssinian species "smells dreadfully from its mode of living," and "takes a great quantity of water."

THE CONDOR (*Sarcorhamphus Gryphus*)—fig. 97, page 241.—The first of the American vultures to which we shall allude, is one of the most remarkable and celebrated species of this family. The nostrils in the American vultures are pierced through, as has already been stated, from side to side of the beak. In the Condor and another species belonging to the same genus, they are surmounted in the males by a large fleshy caruncle, which, in the former, constitutes a comb somewhat resembling that of a cock. The bill in these birds is very strong, and much hooked at the extremity.

The head and neck are quite naked, and the skin on these parts is variously folded.

The Condor, although undoubtedly one of the largest, or perhaps the largest of predaceous birds, long enjoyed a reputation for size and strength to which he was certainly not entitled. This was due to the exaggerated accounts of the older travellers in America, which led their readers almost to believe that this bird rivalled the fabulous *Roc* of the Arabian writers in bulk. It appears, however, from the more trust-worthy accounts of modern naturalists, amongst whom we may mention especially the late Baron Humboldt and his celebrated companion Bonpland, that the Condor scarcely exceeds the Lämmergeyer in size and spread of wing, the ordinary distance from tip to tip being only from nine to eleven feet, and the largest recorded expanse fourteen feet. These are about the measurements of the Lämmergeyer; and as the length of the latter bird from the tip of the beak to the extremity of the tail, is rather greater than that of a Condor with the same expanse of wing, we may consider these birds as approaching very closely in size.

Fig. 97



The Condor (Sarcorhamphus Gryphus).

The basal part of the beak in the Condor is brownish; the tip nearly white. The naked skin of the head and neck is of a reddish colour, with a few scattered black hairs. The front of the neck, beneath the chin, is furnished with a loose membrane, which can be dilated at the will of the bird, in the same way as the wattles of the turkey-cock. Round the base of the neck is a frill of white, downy feathers, like that which has already been described as occurring in other species; and the rest of the plumage is black or greyish-black, with the exception of the wing coverts and the secondary quill feathers, of which the former are white at the apex in the male, and the latter along the outer margin in both sexes. The legs, which are short and very stout, are of a grey colour. The toes exhibit a distinct membrane at their base, and are armed with rather long and stout, but very slightly curved, black claws. The hinder toe is very short, in comparison with that of the birds of prey in general.

The Condor is found along the whole range of the vast chain of the Andes, from near the Straits of Magellan to the republic of New Granada, a few degrees north of the equator. It is most abundant in the tropical parts of this range, especially in Peru and Quito. It is principally an inhabitant of the higher regions of the mountains, from an elevation of about 11,000 feet up to the line of perpetual snow. In its flight, however, it soars far above the latter level, and is justly said by Humboldt to ascend to a greater height in the air than any other bird. That traveller ascertained, by actual measurement, that the height attained by one of these birds must have been at least 23,000 feet above the level of the sea; and in the neighbourhood of Cotopaxi, at an elevation of 14,471 feet, he observed a condor at such an altitude, that it appeared as a mere black speck in the sky. Even at the ascertained level, it is, as he remarks, a singular physiological phenomenon, "that the same bird which wheels for hours together through these highly rarefied regions (where the barometer scarcely stands at 12·7 inches), should be able suddenly, as for instance on the western declivity of Pichincha, to descend to the sea-shore, and thus in the course of a few hours traverse, as it were, all climates."

In its habits the Condor appears closely to resemble the Lämmergeyer, unless its predilection for carrion may be considered rather stronger. But it not only feeds freely on the carcasses of dead animals, but also destroys many lambs, calves, and young llamas, especially when just born and in a perfectly helpless state. For these purposes, the Condors, which usually live singly or in pairs, congregate in small flocks; but there appears to be no foundation for the stories of their uniting to destroy full-grown cattle and llamas, any more than their attacking man or carrying off children in their talons. Of the latter crime, indeed, the structure of their feet may prove them guiltless, for the small development of the hinder toe must render them quite incapable of perpetrating any such enormity. The accounts of their attacking men are equally destitute of foundation. Humboldt learnt from the Indians that the Condors are perfectly innocent of this; and he also states that he frequently approached within ten or twelve yards of them, when sitting three or four together upon the rocks, and that they never showed the least disposition to attack him. Nevertheless, the damage done by the Condors to the domesticated animals of Peru and Chili is so considerable, that the inhabitants regard them as among their most formidable enemies, and miss no opportunity of destroying them. For this purpose, they sometimes lay the carcass of some large animal as a bait, and shoot the Condors as they descend upon it to feed, or, waiting until they have eaten their fill, capture them with the lasso. But more commonly the bait is laid down in a space surrounded by strong palisades, which, by preventing the birds from taking the short run, with their wings half extended, necessary to enable them to rise from the ground in their gorged state, gives the Indians the opportunity of despatching a great number of them at once.

The Condor makes no nest, but lays its eggs upon the bare rocks, simply selecting a spot where there are cavities large enough to receive the eggs, and prevent them from being rolled down when the parent descends upon or rises from them. The situations chosen by the Condors for this purpose are always exceedingly inaccessible. The eggs are said to be two in number, and the Indians describe them as of a white colour, which is also that of a specimen from Chili deposited in the Museum at Paris by M. Claude Gay. M. D'Orbigny, from a fragment seen by him, supposes the eggs to be spotted with reddish-brown.

THE KING VULTURE (*Sarcorhamphus Papa*)—Plate 1, fig 2. The King vulture, the only other species of the genus *Sarcorhamphus*, is particularly remarkable for the brilliant colours which adorn the naked skin of its head and neck. The comb which surmounts the nostrils in the male, is of a brilliant orange colour; the face is blackish violet; a scarlet ring surrounds the eyes; a patch of black down occupies the back of the head, and from this a reddish-brown fold of skin runs down on each side below the eye. The upper part of the neck is bright red, and this colour gradually fades into orange and yellow on the lower parts. The frill surrounding the base of the neck is ashy-grey; the plumage of the upper parts of the body is of a delicate fawn colour, and that of the lower surface white; whilst the quill feathers of the wings and tail are black. The contrast of these varied colours renders this vulture one of the most beautiful of the birds of prey, and forms a costume worthy of the King of the vultures—a title which, however, belongs to him by a better right than only the magnificence of his clothing.

This fine bird is an inhabitant of a great part of South America; but, unlike the condor, it is an inhabitant rather of the vast plains and forests than of the mountainous regions. It is most abundant within the tropics, but extends its range beyond these lines, being found commonly not only in Guiana, Brazil, and Peru, but also in Paraguay and Mexico, and occasionally visiting Florida in search of food. It feeds upon reptiles and carrion, and even upon ordure, and in summer devours great quantities of the fishes which perish in consequence of the drying up of the shallow lakes. Its visits to Florida are said to be generally made after the herbage has been burnt upon the prairies, where it feeds greedily upon the half-roasted snakes and other reptiles which have been unable to escape from the flames. In its ordinary haunts, these birds are frequently met with in considerable numbers in the vicinity of the towns and villages, which are also frequented by flocks of turkey vultures, which will form the subject of the next article. We are told by all writers on the natural history of these regions, that when a band of the latter birds are squabbling over their food after the ordinary vulturine fashion, the appearance of a single bird of this species is sufficient to disperse the whole assembly, who wait patiently at a short distance until their king has satisfied his appetite. This is confirmed by Humboldt.

THE TURKEY VULTURE (*Cathartes aura*), and the **URUBU** (*Cathartes fœtens*).—These two birds, which are very neary allied, are known by the name of *Gallinazos* in the Spanish colonies, where, as in all the warmer parts of America, they are exceedingly abundant. They have a longer and more slender bill than the condor. The head is destitute of caruncles, and covered only with a naked, wrinkled skin; and the nostrils are pierced in the sides of the cere. The Turkey vulture, also frequently called the *Turkey Buzzard*, owes its denomination to the marked resemblance which it presents to a turkey, both in size and the red naked skin upon the head. The same general similarity to the gallinaceous birds, which indeed prevails more or less throughout the Vultures, is also expressed in the name of Gallinazo, which appears to be common to both the species whose names stand at the head of the present article. The Turkey vulture measures about two feet and a half in length, and six feet in expanse of wing. The general colour of its plumage is a sooty brown, with the back and shoulders blackish. The naked skin of the head and neck is reddish, beset with scattered black hairs; and the back of the neck is covered with blackish down. These birds are found not only over the greater part of South America, but also in the southern states of the North American Union; and during the summer they even extend their range still further towards the north. They are very gregarious in their habits, and congregate in great numbers in the neighbourhood of the towns and villages, where they perform the most valuable service in devouring the carrion and offal, which, in many districts of South America especially, are far too abundant to be conducive to the health of the human inhabitants. So numerous are the birds, that Humboldt tells us he has seen seventy or eighty of them at once surrounding a dead ox; and he adds, that, as mentioned in the preceding article, the appearance of a single king vulture in the midst of this crowd is quite sufficient to stop their gormandizing, until the new-comer has satisfied his no less ravenous appetite. By their human neighbours the vultures are never disturbed. The beneficial nature of their operations is thoroughly understood by the inhabitants of the countries frequented by them, and everywhere they are under the protection of the laws, so that to kill one of them would in most places subject the offender to a fine; whilst in Cuba, according to M. D'Orbigny, excommunication is not regarded as too severe a punishment. D'Azara states that this vulture, if trained early, will acquire so much attachment to its master as to follow him on a journey for many miles. The flight of the Turkey vulture is described as being exceedingly lofty and elegant. "On a fine day," says Mr. Darwin, "a flock may be observed at a great height, each bird wheeling round and round, without closing its wings, in the most graceful evolutions. This is clearly done for sport's sake, or perhaps is connected with their matrimonial alliances." According to Mr. Gosse, the soaring of these vultures in flocks is regarded in Jamaica as indicative of a thunderstorm; and he says that at other times they are generally seen singly or in pairs. According to the writer just quoted, the Turkey vulture, called the *John Crow vulture* in Jamaica, would appear occasionally to kill his own game, at least if he can meet with a weakly lamb or pig at a distance from its mother. He will also venture to attack a large hog if it be lying in a sick condition, picking out its eyes; but first discharging his excrements upon it, to see whether it is strong enough to rise, which this indignity rarely fails to effect, if the creature is still capable of any exertion. It was from his observations upon this species that Audubon was led to maintain, that the vultures are guided to their prey rather by the faculty of sight than by that of smell. He found that they would soon descend to attack the stuffed skin of an animal when exposed in the open air; whilst the carcass of a hog, which was concealed under the bushes in a ravine, remained unnoticed by them, although many of them flew over the spot, and it ultimately became so offensive that Audubon himself could not venture to approach it. Mr. Gosse, from his observations on the species in Jamaica, seems to think that both the senses of smell and sight may co-operate in betraying to the bird the presence of its food, and that those naturalists who attribute this to either of these senses exclusively are in error. In support of the view that the olfactory organs have something to do in the matter, he relates the following anecdote—"A poor German immigrant," he says, "who lived alone in a detached cottage, rose from his bed after a two days' confinement by fever, to purchase in the market some fresh meat for a little soup. Before he could do more than prepare the several ingredients of herbs and roots, and put his meat in water for the preparation of his pottage, the paroxysm of fever had returned, and he laid himself upon his bed exhausted. Two days elapsed in this state of helplessness and inanition; by which time the mass of meat and pot herbs had putrefied, the stench becoming very perceptible in the neighbourhood. Vulture after vulture, as they sailed past, were observed always to descend to the cottage of the German, and to sweep round, as if they had tracked some putrid carcass, but failed to find exactly where it was." This led the neighbours to break open the door, when the man was found in a state of utter exhaustion, and his preparations for soup-making in a most intolerably offensive condition.

The Urubu, or Black vulture, as it is sometimes called, closely resembles the preceding in its appearance and habits, so much so indeed, that as both are found in precisely the same countries, the two species have frequently been confounded together. The Urubus are exceedingly common in Peru, where, according to Tschudi, they sit in incredible numbers on the roofs of the houses and along the walls of the streets, exposed to the full blaze of the noonday sun, and sleeping with their heads under their wings.

A third species of the genus *Cathartes* has been described, namely, the CALIFORNIAN VULTURE (*Cathartes Californianus*). It resembles the preceding both in form and size; but was formerly supposed to rival the condor in the latter particular. The general colour of the plumage is black, with the tips of the secondary feathers white. The head and neck are covered with a rather smooth, naked, red skin.

FAMILY II.—FALCONIDÆ.

The Falconidæ include not only the true Falcons, but also the numerous hawks and eagles, nearly all of which exhibit a predaceous disposition of a far more decided character than that of the vultures. The birds of this family are indeed for the most part of an exceedingly rapacious nature, generally feeding principally upon prey captured by themselves, and only condescending to devour such dead carcasses as they find when strongly pressed by hunger. There are, however, some exceptions to this general rule; a few of the species being almost as inveterate carrion-eaters as the vultures, with which they often share their dainty meals. The Falconidæ are distinguished from the vultures—with which they agree in their diurnal habits and in having the eyes placed upon the sides of the head—by the much shorter and more powerful bill, which is always much hooked, the ridge of the upper mandible being generally curved from the base to the apex, and its margins are in most cases armed with a tooth on each side. The base of the bill is enveloped in a cere, in which the nostrils are pierced (fig. 94, p. 236); their eyes are overshadowed by projecting brows; the head and neck are clothed with feathers; the toes are armed with long and powerful claws; and the hinder toe, which in the vultures is comparatively short and weak, acquires a considerable development, and renders the foot a most efficient grasping organ. It is in fact with the feet that these birds seize and carry off their prey, and the bill appears in most cases to be employed only in tearing it to pieces. In the habits and mode of life of the Falconidæ, there is a much greater variety than is observable in the vultures. Some ot them feed almost exclusively upon birds and mammals; others upon snakes, frogs, and other reptiles. Others, again, are fishers by profession; whilst a considerable number, especially of the smaller species, derive a great portion of their nourishment from insects. Their modes of catching prey are also greatly diversified. Some hover in the air, or sail slowly along until their victim appears in sight, when they dart down upon it with the rapidity of lightning; some pursue their prey with the greatest pertinacity, until they get an opportunity of seizing it with their murderous talons; whilst others haunt woods and thickets, and appear to lie in waiting for their food. They usually nidificate amongst rocks or in tall trees, building a nest of sticks on which they lay from two to five eggs, which are almost always of a white colour, spotted with reddish-brown. The females are generally larger than the males, but inferior to them in intensity of colour; and the young birds pass through several changes of plumage before attaining their adult dress. The differences presented by the numerous species of birds forming this family in their minor characters, together with corresponding differences in their habits, have led to their division into numerous minor groups, which we may adopt here as sections, commencing with the Caracaras, which from their carrion-eating habits, must be regarded as most nearly approaching the preceding family.

CARACARAS.

THE CARACARA (*Polyborus braziliensis*), one of the best-known species of this group, is an inhabitant of South America, where, according to M. D'Orbigny, it replaces the serpent-eater ot the Cape of Good Hope, from the number of snakes which it destroys. It does not, however, confine itself to this diet, but feeds indifferently upon carrion, insects, and mollusca, and also, like many vultures, attacks new-born lambs. D'Orbigny states that it is never seen to give chase to birds, but, on the other hand, in some districts it can scarcely fly without being pursued by some species of small birds, against which it makes no effort to defend itself. Chickens, however, are not safe from its depredations, and it not unfrequently accompanies the sportsman in his excursions, and seizes upon the birds shot by him. Mr. Darwin informs us that the Caracara, together with a smaller but nearly allied species, the chimango, frequents the neighbourhood of the slaughter-houses, to feed on the offals thrown out; and these two birds also follow the vultures in devouring the carcass of any animal that dies in the open country, and never leave it until the bones are quite clean. According to some writers, the Caracaras are not above taking their carrion at second-hand; they are said to watch for one of the vultures returning from his repast, when they fly out upon him and pursue him until he finds it necessary to disgorge his food, upon which the conspirators immediately descend. D'Azara states that these birds also combine to pursue some of the larger birds, such as the heron. M. D'Orbigny describes the Caracaras as accompanying the traveller throughout the vast solitudes of the South American forests, but never making their appearance until he comes to a halt; then suddenly he will see them perching upon the trees in his vicinity, and apparently waiting for the remains of his dinner. Mr. Darwin, however, attributes a far less amiable object to these intruders, and regards this conduct on their part as an evidence of their desire to indulge their carrion-eating propensities at the personal expense of the traveller. Of this, he says, any one may convince himself, "by walking out on one of the desolate plains, and then lying down to sleep: when he awakes, he will see, on each surrounding hillock, one of these birds patiently watching him with an evil eye." The Caracara, which is also called the *Carrancha* in South America, is said to derive its name from its peculiar guttural cry, which is compared by Mr. Darwin "to the sound of the Spanish guttural, *g*, followed by a rough double *r*, *r*." When uttering this cry it throws the head back, until at last the crown almost touches the lower part of the back, the beak being all the while kept wide open. It is about the size of our common kite, and has a tail nine inches in length. The general colour of the plumage is a blackish-brown, with the neck and breast brownish-grey, barred with brown; the top of the head is black, and the feathers of this part are elongated, so as to form a sort of crest, which the bird can elevate at pleasure; the feathers of the tail are of a dirty-white colour, with numerous transverse dusky bands, and the tips black. The feet are yellow with black claws, and the cere and cheeks are naked and dull red. It is rather an indolent bird, especially when gorged with food, and never flies to any great height; on the ground it runs with facility. Its nest is sometimes built on the ground, but more commonly in trees or on the ledges of rocks. It is rather large, and consists of sticks, sometimes lined with a few hairs and feathers; in this it lays five or six eggs, which are pointed at one end, and spotted with red on a reddish-brown ground.

THE CHIMANGO (*Milvago Chimango*), which has been already mentioned as accompanying the caracara in its carrion-feasts, is said by Mr. Darwin to be generally the last bird that leaves the skeleton of a dead animal; it "may often," he adds, "be seen within the ribs of a cow or horse, like a bird in a cage." Like the caracara, its appetite appears to be satisfied with anything, as it will even eat bread when this is thrown out of a house with other offal. It also frequents the sea-coast and the margins of lakes and swamps, in search of small fish. In its general habits it resembles the caracara.

THE CHIMACHIMA (*M. Chimachima*), another species, is said to attack beasts of burden upon which it perceives wounds or sores; these it tears with its bill, until the unfortunate victim is forced to roll himself upon the ground to get rid of his tormentor.

THE SOUTHERN CARACARA (*Milvago australis*), appears to be peculiar to the coasts of the southern extremity of America and the Falkland Islands, where it is exceedingly abundant. Its habits are very similar to those of the caracara, but it appears to exceed even that bird in impudence. It will seize upon birds shot by the fowler, and on one occasion recorded by Mr. Darwin, one of these birds actually pounced upon a dog that was lying asleep close to his master. When a hunting party has killed an animal, these caracaras soon collect in the neighbourhood, and stand on the ground waiting for their share of the spoil. Sometimes they are said to stand, several in company, at the mouth of a rabbit-hole, in order to seize on the animal as soon as it comes out. These various methods of obtaining food indicate considerable ingenuity, and the birds appear to be of an exceedingly inquisitive disposition, which often leads them into mischief. They are also arrant thieves. When the *Adventure* was lying in harbour at the Falklands during the winter, they would fly on board every day, and it was necessary to keep a sharp look-out to prevent them from tearing the leather from the rigging, and stealing the fresh meat and game hung up at the stern. On one occasion they carried a heavy black glazed hat nearly a mile; on another they went off with a pair of heavy balls, used in the southern parts of America for catching cattle; and a small compass in a red morocco case was so tempting a prize that they carried it off, and it was never again found. They are exceedingly quarrelsome, and when irritated fall into such a passion that they tear up the grass with their bills. Their flesh is said by the sealers who have tried it to be very white, and good eating. They build their nests on the rocks only in the small islets of the Falkland group, which, as Mr. Darwin remarks, "is a singular precaution in so tame and fearless a bird."

BUZZARDS.

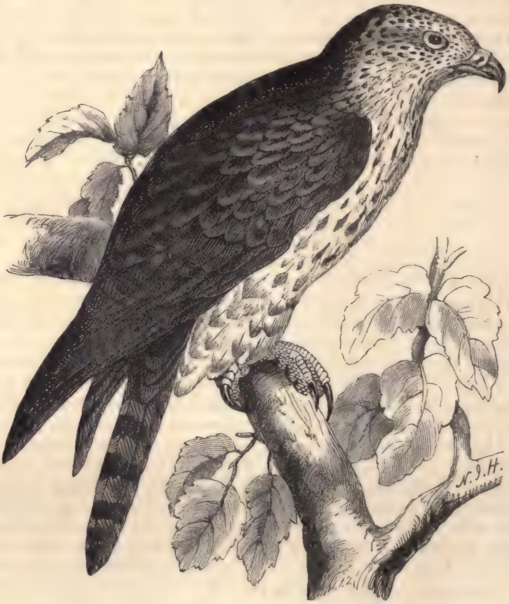
THE COMMON BUZZARD (*Buteo vulgaris*) is a common British hawk, which is also met with in most parts of Europe. It measures about twenty inches in length; the plumage of the upper parts, the neck and breast, are of a dark-brown colour; the throat and belly are greyish-brown, spotted with dark-brown; the tail pale greyish-brown, with ten or twelve dark brown transverse bars; the beak lead colour; and the cere and legs yellow. The beak in the Buzzard is short and stout, compressed on the sides, and has the margins of the upper mandible sinuated; the nostrils are large; the wings long, but obtuse; the tail of moderate length and rounded; the tarsi rather long and stout, covered with scales in front, as are also the toes; the remainder of the foot is reticulated, and the claws are long, strong, and acute. The common buzzard is generally distributed in the British islands, and also occurs abundantly in most parts of Europe. In some localities it is called the Kite or Glead, although quite distinct from the bird to which these names properly belong; and in other places it bears the name of the Puttock. It is rather an inactive bird, but often soars to a great height, and sails in circles like an eagle. When in pursuit of prey it glides over the fields, at no great distance from the ground, and pounces down upon any articles of food that come within its ken. Its food consists of small birds and the young of the grouse and partridge, the smaller quadrupeds, reptiles, insects, and even earthworms—all of which it captures in the way above described, very rarely pursuing its feathered prey when on the wing. Mr. M'Gillivray states that he once found the stomach of a buzzard filled "with leaves of plants and roots, along with beetles and an earthworm." After feeding it retires to some secluded spot, and there reposes until the food is digested, and its returning appetite again suggests to it the necessity of exertion. The nest of the common buzzard is composed of sticks and twigs, mixed with heath, and lined with wool and grass. Its position varies according to the nature of the country inhabited by the birds; in rocky districts it is built on the ledges of the rocks, and in the more undulating and wooded localities amongst the branches of trees; but the material and construction of the nest are the same in both cases. These birds are said to save themselves part of the trouble of building by taking possession of the nest of a crow and enlarging it to suit their purposes. In these nests the females deposit from three to four eggs, which are of an almost perfectly oval form, and of a dull, or slightly bluish white colour, sometimes nearly spotless, but usually spotted with rusty brown.

Buzzards are said to attend to the wants of their young for a longer period than most predaceous birds; and they certainly seem to possess very strong parental instincts. In captivity female buzzards have been repeatedly known to hatch the eggs, and bring up the young of other birds; and the following curious example of this, related by Mr. Yarrell in his "History of British birds" will probably be entertaining to our readers:—He tells us that "a female buzzard, kept in the garden of the Chequers inn at Uxbridge, showed an inclination to sit, by collecting and bending all the loose sticks she could obtain possession of. Her owner, noticing her actions, supplied her with materials; she completed her nest, and sat on two hen's eggs, which she hatched, and afterwards reared the young. Since then she has hatched and brought up a brood of chickens every year. One summer, in order to save her the fatigue of sitting, some young chickens just hatched were put down to her; but she destroyed the whole. When flesh was given to her, she was very assiduous in tearing it, and offering it as food to her nurslings, and appeared uneasy, if, after taking small portions from her, they turned away to pick up grain."

THE ROUGH-LEGGED BUZZARD (*Buteo lagopus*)—Plate 3, fig. 7—has been raised by many ornithologists to the rank of a distinct genus under the name of *Archibuteo;* its principal distinction from the common buzzard consists in its having the tarsi clothed with feathers down to the origin of the toes. It is found in Britain, but by no means abundantly, and appears to be a winter visitor to this country; its real dwelling-place being the cold northern regions of both continents. In its general habits it resembles the common buzzard; it is described by Audubon as a sluggish bird, residing on the meadows and low grounds, and feeding principally on small quadrupeds and reptiles, although it also appears sometimes to attack larger animals, such as rabbits and ducks. Its nest is built with sticks, amongst the branches of trees; and it lays two eggs. Its southern migration during the winter is said sometimes to extend as far as the Cape of Good Hope.

THE HONEY BUZZARD (*Pernis apivorus*), which is placed by some ornithologists with the kites, is a common bird in some parts of Europe, but a rare visitor to this country, where it is only met with in the summer. It is also known to occur in Northern Africa and in Asia. It has a rather weak bill, curved from the base, which is covered by a large cere, close to the anterior margin of which the elongated nostrils are placed obliquely. The spaces between the base of the bill and the eyes are clothed with small feathers, whereas in the buzzard these parts are covered with hairs, and the tarsi are reticulated.

Fig. 98



The Honey Buzzard (Pernis apivorus).

The Honey buzzard measures from twenty-two to twenty-five inches in length; the colour of its upper surface is a nearly uniform brown, with the primarie black, or nearly so; that of the lower surface is a pale yellowish-brown; the top of the head is bluish in the male, whitish in the female, spotted in the latter with brown; the tail feathers are barred with brown. The beak is black, with the cere grey, and the feet yellow, with black claws.

The food of this bird consists of small mammalia, birds, reptiles, and insects; and in the summer and autumn it appears to derive a great part of its nourishment from the larvæ of wasps, which it obtains by digging out the nests, and breaking up the comb. A specimen observed by Mr. Selby, near Twizel in Northumberland, was seen "to rise from the situation of a wasp's nest, which it had been attempting to excavate, or, in fact, to a certain extent had accomplished; and the large hole which had been scraped showed that a much greater power could be employed, and that the bird possessed organs much better fitted to remove the obstacles which generally concealed its prey, than a superficial examination of its feet and legs would warrant us in ascribing to it. A few hours afterwards, the task was found to be entirely completed; the comb torn out and cleared from the immature young; and after-dissection proved that at this season (autumn) at least, birds and mammalia formed no part of its food." The larvæ of wasps also seem to constitute the chief food of the young. In fact, in most cases insects appear to have been the chief food of the specimens killed in England; the larvæ of wasps and bees being mixed with caterpillars, and beetles and their larvæ; in one examined by White of Selborne, the stomach contained the limbs of frogs and a great many grey slugs. These birds have, however, been captured in traps baited with young rabbits; they have been seen to strike and carry off young pheasants; and a specimen kept in confinement killed and ate rats, as well as birds of considerable size, with great ease and appetite.

In a state of nature it is described as rather an inactive bird, rarely flying, except from one tree to another, and never rising to any great elevation; on the ground it runs with great rapidity, almost like a fowl. Its nest is built in some high tree in a wood or forest, and is composed of twigs, and lined with dead leaves. The eggs, which vary from two to four in number, are blotched over with two shades of orange-brown.

THE CRESTED HONEY BUZZARD (*Pernis cristata*) is a native of the northern parts of India, where, however, it does not appear to be common. Its head is furnished with a crest, which it is able to raise and depress at pleasure. The flight of this species is slow, and its general habits seem to resemble those of its European relative. The stomach of a female shot by Mr. Jerdon contained a soft green mass, which he supposed to be the remains of half-digested caterpillars; that of a male bird killed by the same gentleman contained a large quantity of pure honey. Mr. Elliot also found in the stomach of a specimen a mixture of ants, wax, and honey; so that we may suppose the natural food of this species to consist, partly at all events, of the last-mentioned substance, for which the European species is also said to entertain a predilection. A second specimen examined by Mr. Elliot betrayed more predaceous propensities; its stomach contained the hair of a rat.

THE ABYSSINIAN BUZZARD (*Buteo augur*) is an exceedingly common bird in Abyssinia, where it is regarded by the inhabitants as furnishing important omens to those about setting forth on a journey. According to Salt, the Abyssinians, on meeting one of these birds at the commencement of a journey, watch it very carefully, and draw good or bad omens from its motions:—"If it sit still with its breast towards them until they have passed, it is a peculiarly good sign; and everything is expected to go well during the course of the journey. If its back be turned towards them, it is considered an unpropitious sign, but not sufficiently so to create alarm; but if it should fly away hastily on their approach, some of the most superstitious among them will immediately return back to their homes, and wait till a more favourable opportunity for commencing their expedition occur." Dr. Roth states that he never found anything but locusts in its stomach; but, according to Rüppell, it feeds upon small birds and bats, and pursues the latter chiefly when roused from their retreats by the passage of caravans or other large bodies of men, which it frequently accompanies or precedes. To this circumstance Dr. Rüppell ascribes the belief in the faculty of divination supposed to be possessed by this bird, as above described, and which is expressed in its specific name.

EAGLES.

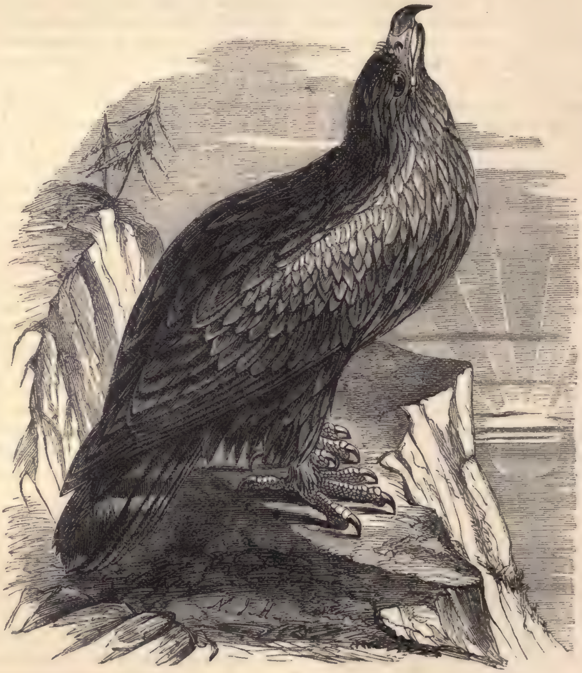
THE GOLDEN EAGLE (*Aquila chrysaëtos*), which is certainly the finest British species of the group to which the name of eagles is commonly applied, and yields in size and majesty to few if any of his foreign relatives, must first engage our attention. This magnificent bird is found not only in Britain, and in all the mountainous parts of the continent of Europe, but also occurs in Asia as far to the east as Northern India, in the north of Africa, and also in North America. Its usual length is about three feet, and the wings spread seven or eight feet when extended. The general colour of the plumage is dark brown, with the belly and thighs bay, and the quill feathers of the wings blackish. The tail feathers are varied with two shades of brown; the beak is of a bluish horn colour, the cere and toes are yellow, and the claws black. The tarsi are clothed with feathers down to the root of the toes.

In its structure the golden eagle exhibits the characteristics of its tribe in the highest perfection. Its beak is rather short, but exceedingly powerful, and the upper mandible terminates in a strongly-hooked and acute point; but the sharp teeth which we shall find in the true or *noble* Falcons, on the margins of the mandible, are here represented only by a slight festoon. The feet are enormously strong, and the toes armed with claws of great length and acuteness, curved in such a manner that the grasp of the foot must immediately bury them in the body of the prey.

The flight of this bird, as might be expected from its great length of wing, is most majestic and powerful, and it appears to delight in soaring to a great height in the air. But even when the bird is at such an elevation as to appear only like a small black speck in the sky, the acuteness of its vision is so great, that it can readily discover its prey upon the ground below it, when it will descend with the most astonishing velocity to seize its victim. Its great strength enables it to prey upon creatures whose size would prevent them from being attacked, or at all events being carried off by any of the smaller Falconidæ, and although it does not contemn such small game as partridges and grouse, it destroys lambs, even when several weeks old, and young fawns, which its great muscular power enables it even to carry off in its talons to its nest among the rocks. Hares and rabbits also constitute a considerable portion of its food. The eagle is, in fact, the great tyrant of the wild regions which he inhabits, but as we must bear in mind that nothing that he can meet with there has any power of defending itself from his terrible swoop, we must not allow ourselves, as our forefathers did, to magnify him into a type of magnanimity and courage. This view is induced by the magnificent aspect of the bird, and the abundant evidences of terrible energy furnished by his every movement; in true courage he is not superior to most of the smaller hawks, and certainly inferior to the peregrine and many other falcons, which will even venture to attack and drive away this so-called monarch of the waste, when he approaches too near their nests.

The Golden eagle, as already stated, is an inhabitant of mountainous regions, in the wild fastnesses of which he dwells in solitary state, far from the habitations of man. On the highest and most inaccessible ledges of the rocks the eagles build their nests, or *eyries*, which consist of a vast assemblage of sticks, forming a flat platform of several feet in diameter. Upon this the female deposits two, or at the utmost three eggs, which are of a dirty-white colour, mottled with pale reddish-brown. The eggs are laid about the end of March or the beginning of April, and in the course of a month the young eaglets are hatched. During their growth the parent birds are indefatigable in attending upon them and supplying them with food; and such an abundant supply of game do they bring into the nest, that we are told of one instance in which a native of Kerry obtained a comfortable subsistence for himself and his family throughout a summer of scarcity, by robbing the nest of an eagle of the food brought for the support of the young birds, whose wings he clipped in order to retard their flight, and thus prolong the attendance of the

Fig. 99.



The Golden Eagle (Aquila chrysaëtos).

parents. These birds are said to be very long-lived, and one of them is recorded to have died at Vienna after passing no less than one hundred and four years in confinement. Their cry is a loud sharp scream. They generally retain their ferocity even after long captivity, seldom even showing any affection for the person who feeds them; but notwithstanding this and the general character for intractability which has been founded upon it, instances are on record of the reclamation of the Golden eagle, even so far as to enable him to be used for the purposes of falconry. At the same time his temper seems to be rather uncertain, and he is by no means so desirable a favourite as the true falcons.

The Golden eagle, like the lammergeyer, has been accused of sometimes carrying off young children to its nest, but as far as we are aware, none of these stories have been fully authenticated. Another popular notion, which is doubtless in some measure connected with the supposed regal nature of the bird, namely, that he will feed on nothing that he has not himself killed, is certainly destitute of foundation; the eagle, when he pays an occasional visit to the shore, will feed freely upon dead fish, and at other times, especially in winter, he does not disdain carrion. Mr. M'Gillivray states that he had seen several eagles hovering over a dead sheep, and in the Scotch islands they are often lured to their destruction by the exposure of the carcases of animals, in the vicinity of a pit or other shelter in which the gunner lies concealed.

THE SPOTTED EAGLE (*Aquila nævia*) is another European species, of which specimens have been killed in Britain. It is an inhabitant of the mountainous districts of central Europe, but extends its range southward into Egypt; it also occurs in Asia as far as Nepaul and Calcutta. It is considerably smaller than the golden eagle, being about the size of a large cock; its general colour is brown, but the feathers of the legs and sides are spotted with white, and the quill feathers of the wings are terminated by whitish tips. It feeds on small quadrupeds and birds, and builds its nest on high trees, laying two eggs, slightly blotched with red.

BONELLI'S EAGLE (*Aquila Bonellii*) an inhabitant of Southern Europe, is also found in Asia as far as India, where, however, it appears to be a rare bird. It is not common in Europe, where it lives in the marshy forests of Sardinia, Sicily, and the south of France. It feeds principally upon birds, and is said to be especially fond of ducks. In India it also inhabits wooded and jungly districts, sitting upon the high branches of trees to look out for its prey, which consists of jungle-fowl, partridges, and hares, and occasionally even the peacock falls a victim to its talons. Sometimes this eagle takes up its abode in the vicinity of the villages, when it makes fearful havoc among the domestic poultry. Mr. Jerdon gives the following account of the mode of attack adopted by a pair of these birds which haunted some pigeon-houses in the Neilgherries. He says, "On the pigeons taking flight, one of the eagles pounced down from a vast height on the flock, but directing its swoop rather under the pigeons than directly at them. Its mate, watching the moment when, alarmed by the first swoop, the pigeons rise in confusion, pounces unerringly on one of them, and carries it off. The other eagle, having risen again, also makes another stoop, which is generally fatal." The Indian falconers also, according to the same authority, have generally stories to relate of these eagles carrying off favourite hawks.

THE TAWNY EAGLE (*Aquila nævioides*) is the common eagle of India, where it is known as the *Wokhab*. It is also an inhabitant of Abyssinia, and probably of the intervening countries. Like the preceding species, it dwells either in the jungly districts or in the vicinity of towns and villages, over which it is frequently seen daily in company with the kites. Its food consists of hares and other game, but it also condescends to devour rats, lizards, snakes, and even insects, and it appears to share with the kites in any carrion that may fall in its way. Mr. Jerdon thinks that it obtains much of its food by robbing other birds of prey, and he quotes a statement of Mr. Elliot's, that this eagle is exceedingly troublesome to the falconers by pursuing the hawks for the sake of their jesses, which it mistakes for some kind of prey.

THE BOOTED EAGLE (*Aquila pennata*) has the feet feathered down to the toes, the plumage of the back brown, and that of the lower parts white, marked with narrow brown lines. It is the smallest of the true eagles found in Europe, measuring only about twenty inches in length. It occurs principally in the eastern parts of Europe, and, like the preceding species, is an inhabitant of India. In its appearance and mode of flight it resembles the kite, and, like that bird, it is said to be a "noted robber of the dove-cot and poultry yard."

THE IMPERIAL EAGLE (*Aquila imperialis*), which is also common to Europe and Asia, and yields only to the golden eagle in size, abounds particularly in Turkey, Egypt, and the north of Africa. It inhabits the hilly districts, and when in search of prey, flies slowly along at no great elevation, hunting over the bushy vallies and ravines. It is said by Mr. Jerdon to strike frequently at game raised by sportsmen.

THE WEDGE-TAILED EAGLE (*Aquila fucosa*) is a native of Australia and Van Diemen's Land, where it evidently takes the place of the golden eagle of Europe, to which it is scarcely inferior in size. A specimen killed by Mr. Gould measured six feet eight inches from tip to tip of the wings, and he considers this to be far from the largest bird of this species which had come under his notice. The wedge-tailed eagle frequents the interior of the country, and like its northern analogue, the golden eagle, rarely makes its appearance on the coast. It preys principally on the smaller species of kangaroos and also on the large Australian bustard; and in the districts inhabited by the European settlers it is so destructive to the young lambs, that the shepherds wage with it a war of extermination. It will also devour offals and carrion; for the former it will follow the kangaroo-hunters for days, and Mr. Gould states, that in one of his journies he saw no less than thirty or forty of these birds assembled round the carcase of a dead bullock, some sitting in a gorged state upon the neighbouring trees, while others were still enjoying the feast.

The nest which is very large and nearly flat, is placed amongst the most inaccessible branches of trees, and composed of sticks and branches. Mr. Gould was unable to procure the eggs.

THE MARTIAL EAGLE (*Spizaëtus bellicosus*)—Plate 2, fig. 6—often called the *Griffard* by the French writers, is a large and powerful species found in the southern parts of Africa. It is about the size of the golden eagle, of a brown colour above, with the edges of the feathers pale. The lower surface is whitish, and the feet are feathered down to the toes. The Martial eagles are generally seen in pairs in the mountainous districts. They prey upon antelopes and hares, and during the period of incubation, the male bird provides his partner with food. They are described as exceedingly courageous, driving all other birds of prey from the localities which they inhabit. The cry of this bird is very sharp and piercing, and may be heard when the eagle has soared quite out of sight. The nest, which is built either on the top of a high tree, or amongst the steepest and most inaccessible rocks, constitutes a flat platform of four or five feet in diameter, and often two feet in thickness; and so solid in its construction, that it will bear the weight of a man. Its foundation is composed of several stout sticks, interlaced with a quantity of flexible twigs, serving to form a solid substratum, when the nest is made on a tree; and this is surmounted by a thick mass of small twigs, moss, dry leaves, roots, and reeds, which constitute the greater part of the nest. The surface of this platform is covered with a layer of small fragments of dry wood, upon which the eggs are laid; and this edifice, as might be expected from the labour attending its construction, serves the couple for several consecutive years. The eggs are nearly round, of a pure white colour, and almost three inches in diameter.

THE HARPY EAGLE (*Thrasaëtus Harpyia*). The preceding are some of the principal species of eagles inhabiting the eastern hemisphere, and one of them, the golden eagle, also extends its range into the northern part of the American continent; we have now to describe two species which belong exclusively to South America. The first of these, the Harpy eagle, is a formidable bird which inhabits the vast forests of intertropical America, especially along the course of the great rivers. It is the only species of its genus, which is distinguished from the other eagles by having a very strong beak, undulated at the margins, and very greatly hooked at the tip; the wings short, scarcely reaching the base of the tail, which is long; and the feet very stout, the tarsi reticulated and the toes scaled in front. The head in this fine bird is clothed with large rounded feathers, which can be raised at pleasure to form a sort of crest.

This large and powerful eagle is said to prey almost entirely upon Mammalia, and to have a particular preference for the monkeys and sloths which abound in the forests of South America. In the morning it is seen flying over the forest in search of these articles of diet, but it is also said to attack other quadrupeds, and even the fawns of the South American deer are not free from its attacks. According to the natives it never attacks birds. Mauduit asserts that the strength of this bird is so great that it can split the skull of a man by a blow with its beak, and it is certain, from M. D'Orbigny's experience, that, when wounded, the Harpy eagle does not hesitate to attack its human enemies. That distinguished traveller, when navigating the Rio Securi in a canoe, saw a large specimen of the Harpy perched upon one of the lower branches of a tree; he landed in order to shoot it, but the soil being muddy, his Indians got ashore first and wounded the bird with an arrow. It flew to a short distance, when it was again wounded, and finally knocked on the head, until life being supposed to be extinct, the Indians plucked out the feathers of the wings, tail and head, upon which they set a high value, and even stripped the bird of some of its down, which they employ, as we do spiders' webs in England, for stopping the bleeding of wounds, &c. In this mutilated condition they brought the bird to the canoe, to the great disgust of the enterprising voyager. What followed will be best told in his own words:—"Being regarded as dead, the bird," he says, "was placed in the canoe in front of us; and we did not remark that, recovering from its state of insensibility, it revived by degrees; we did not perceive this until, becoming furious, and no doubt longing for revenge, it threw itself violently upon us, although, fortunately, it could only make use of one of its talons; with this, however, it pierced through my arm from one side to the other, between the *cubitus* and the *radius*, and at the same time tore the remainder of the arm. It also endeavoured, happily without success, to pierce me with its beak; and, notwithstanding its wounds, it required two people to make it let go its hold."

THE URUBITINGA (*Morphnus Urubitinga*), another inhabitant of the South American continent, is found, according to D'Orbigny, only in the plains, and there always on the borders of lakes, rivers, and marshes. It is a solitary bird, and rather sedentary in its habits, taking up its position on the top of some dead tree, where it will sit for hours watching for the appearance of its prey, which consists principally of reptiles, small mammalia, and dead birds. On catching sight of its prey it descends upon it rapidly, and after its meal returns quietly to its post. It flies but little except in the morning and evening, and then sometimes beats about the neighbourhood of its lodging, flying slowly at a considerable height. It generally sleeps on the lower branches of trees. The habits of the other species of the genus *Morphnus*, of which several occur in South America, are very similar.

THE SERPENT EAGLE (*Circaëtus gallicus*), called the *Jean-le-Blanc* in France, is a small species, measuring only about two feet and a half in length. It has a large head, with a strong black beak, enveloped to the base in a large bluish cere, near the margin of which the nostrils are pierced; the tarsi are long, and the toes short, and terminated by short and slightly curved claws. The plumage of the head, throat, and lower part of the body is white, spotted with brown; that of the upper surface is brown; and the tail, which is of a square form, is greyish-brown, banded with a darker brown. The feet are bluish-grey.

In Europe this bird is found principally in the vast pine forests of the north and east, but it also occurs, although rarely, in France; in the Asiatic continent it extends its range as far as Bengal, and in the more northern regions probably still further. In Europe it preys upon the smaller quadrupeds and birds, occasionally feeding upon reptiles and even insects; but in India its preference for reptiles is so marked, that its native names refer to the havoc which it makes among the snakes. It does not, however, confine itself to this food, but devours small quadrupeds and birds; and Mr. Elliot found a centipede in the stomach of one, together with a snake two feet in length. It builds in trees, and lays two or three eggs of a bluish-white colour, sometimes spotted with brownish.

THE SHORT-TAILED EAGLE (*Helotarsus ecaudatus*), an inhabitant of the southern parts of Africa, is distinguished from all the other eagles by the extreme shortness of its tail, which is almost entirely concealed beneath the wings when these are closed. The eyes are surrounded by a naked skin, which, with the cere, is of a bright red colour. So short is the tail that Le Vaillant, the first discoverer of the bird, fancied it to be an eagle which had been deprived of its tail by some accident; its aspect accordingly is very deficient in grace, and its movements in the air are exceedingly singular. This aerial play, which appears to be connected with the courting of these remarkable birds, is compared by Le Vaillant with the tricks of a tumbler, and he gave this eagle the name of the *Bateleur* from this circumstance. It is by no means choice in its diet, but feeds freely, like the vultures, upon carrion; nevertheless it frequently destroys young antelopes and lambs, and also sickly sheep. Its nest is built in trees, and the female lays three or four bluish-white eggs.

THE WHITE-TAILED EAGLE (*Haliaëtus albicilla*), the first of the group of sea-eagles to which we shall refer, is an inhabitant of the greater part of Europe, especially the northern regions of that continent, and extends its range eastward as far as Lake Baikal in Siberia. It is also met with in Iceland and Greenland, but does not occur in North America. It is a large species, the adult female measuring nearly three feet in length, so that it is little inferior in size to the golden eagle; its general colour is brown, lighter and darker on different regions of the body, the back and wings being darkest; the tail is pure white, the feet, cere, and beak yellow, and the claws black. In Britain it is a more common species than the golden eagle, from which it differs in many important characters, especially in the much greater length of the beak, and the comparative slenderness of the claws. In its habits it is more sluggish and vulturine than the golden eagle and its immediate allies.

The White-tailed eagle usually inhabits rocks and cliffs overhanging the sea, from which it dashes down impetuously to seize either birds or fishes, and where seals abound it not uncommonly attacks them. At other times it carries its marauding excursions inland, destroying land birds and quadrupeds, and evincing a particular partiality for young fawns and dead deer. It is more abundant in the latitude of Britain in the winter than in the summer; and, according to Temminck, it follows the flocks of geese which migrate annually to and from the Arctic seas. Nevertheless numerous specimens of these birds remain throughout the summer, and breed upon the rocks surrounding the Orkney and Shetland islands, and other northern coasts of the British islands; although from the number of them that have been killed, on account of their destruction of the young lambs, they are by no means so abundant as formerly. The nest, which is built upon a ledge of rock, usually at a great height above the sea, is of large size, consisting of a flat platform, about five feet in diameter, composed of sticks, heath, dried sea-weed, grass, wool, &c. Upon this are deposited the eggs, usually two in number, about the size of that of the goose, but broader and of a white colour, with a few pale red spots, especially towards the larger end. Nidification commences about the middle of spring, and the young are hatched early in June. The young are able to fly about the middle of August, but the old birds generally continue to feed them for some time, and, according to some writers, the parents quit the neighbourhood when the young birds are able to provide for themselves; unlike the golden eagles, which generally drive their offspring away to some distance, and often occupy the same nest for seven or eight consecutive years.

In courage the White-tailed eagle is very inferior to the golden eagle, rarely attacking any large animal, and feeding contentedly upon carrion of all sorts. In the Shetlands they are known to sweep round the cottages early in the morning, to pick up any poultry that may be about; but, according to Dr. Edmondston, the flocks of geese which are turned out in those islands to pasture upon the hills during the summer and autumn, are rarely attacked by the eagles, although in the immediate vicinity of their haunts. "The wing of the gander," he says, "which not unfrequently is uplifted in defence of his young, has a moral, if not a physical power, which the robber Erne seems to quail under." The same gentleman tells us that, "occasionally, during warm weather, skate and halibut bask on the surface of the water, and the eagle pounces on them; but several instances have occurred of this aquatic hunt being fatal to him. If the fish is not so large as to be able immediately to drag him under the water, he elevates his wings, and in this way, if the wind happens to be blowing on the land, he often manages to reach it in safety." On reaching the shore, however, he is compelled to liberate his claws with his beak, and it is this circumstance that renders these piscatorial exploits so dangerous, unless the fish captured be of the right size, and the wind in the right direction. The Sea eagle feeds freely upon any dead fish that may be thrown up on the shore, and he seems to perceive these objects from a great height in the air.

THE WHITE-HEADED EAGLE (*Haliaëtus leucocephalus*), which is also called the BALD EAGLE, is an abundant species in the United States of North America, where it takes the place of the white-tailed eagle of Europe. It exceeds the European species in size, and especially in extent of wing, but, like it, inhabits the vicinity of the sea, and also of the lakes and rivers. In its general habits it greatly resembles the white-tailed eagle, feeding with avidity upon carrion, and exhibiting a decided partiality for fish. In Wilson's time this species was very abundant about the Falls of Niagara, watching, in company with the ravens and vultures, for the carcases of animals brought down by the force of the great cataract. In obtaining his supply of fresh fish, the White-headed eagle exhibits an amount of sagacity which preserves him from the unpleasant consequences sometimes attending the piscatorial proceedings of his European congener—in fact, he does his fishing by proxy. Perching on the bough of a tree, or on some other elevated position on the coast, he watches the manœuvres of one of his near relations, the smaller and less powerful osprey or fish-hawk (*Pandion Haliaëtus*). As soon as he sees the osprey dash down into the waters, and emerge again with his prey struggling in his talons, the Bald eagle quits his post of observation and darts off in pursuit of the successful fisher. The latter, encumbered with his prey, is quite unable to contend in flight with his pursuer, who endeavours to rise above him; and the manœuvres of the birds in this struggle for the upper hand, are described as exceedingly interesting. The conclusion of the affair is, however, nearly always the same—the eagle, being quite unencumbered, generally overcomes the osprey; the latter lets his prey drop with a scream of disgust; and the piratical pursuer then descends with astonishing rapidity, and usually manages to secure the booty before it reaches the water. One can sympathize with Wilson in his regret that so unprincipled a bird should have been selected as the emblem of the United States; for, notwithstanding the ingenuity displayed in the proceedings just described, it must be confessed that the industrious osprey is the more respectable animal of the two. Occasionally, however, a kind of revolution takes place; the ospreys, on a stretch of coast infested by a Bald eagle, seem to grow tired of the exactions of their plunderer, and, making common cause, drive him from their precincts. Under these circumstances he often directs his course inland, where he commits great depredations amongst the weaker domestic animals—little pigs and lambs are said to be particular objects of his attention. Wilson also mentions an instance in which one of these birds, pressed by hunger, attempted to carry off a young child, and actually dragged it along for several feet, when its frock fortunately giving way, the robber was disappointed of his expected meal.

The White-headed eagle builds sometimes on the rocks and sometimes amongst the branches of tall trees. The nest is composed of the same substances as that of the White-tailed eagle, sticks, tufts of grass, &c.; it serves the birds for several years, and is added to at every breeding season, so that in course of time it consists of a vast mass of materials. The eggs are two in number, of a bluish-white colour, without any spots, and, according to Wilson, one of the eggs is laid a considerable time before the other. The parents are much attached to their young, which they tend with great assiduity, and the female has been known to adhere so pertinaciously to her young family, when the tree containing her nest had been set on fire, that at last she made her escape with considerable difficulty.

THE WHITE-BELLIED SEA EAGLE (*Haliaëtus leucogaster*) is a rather smaller species than the preceding, which is found, although not very abundantly, about the coasts and lakes of the East Indies and its islands, and also in Australia. In some parts of India, according to Mr. Blyth, it is known as the *Snake-killer*, a name which is also applied to the *Circaëtus gallicus;* the natives of Sumatra call it the *Bald eagle*, and on the coasts it appears to subsist principally upon fish, which it often carries off from the nets or boats of the fishermen. Mr. Gould says that in Australia these birds do not capture living fish by plunging into the water, but content themselves with the dead fish and cetacea which are thrown up on the beach; they also probably feed upon mollusca and other marine animals, and Mr. Blyth found some joints of crustacea in an Indian specimen examined by him. They nidificate, according to Mr. Gould, sometimes in trees and sometimes on the rocks. The sexes are similar in their plumage, having the head, neck, and the whole lower surface of the body white, the back and wings grey, the primaries and base of the tail feathers blackish, and tips of the latter white.

THE OSPREY (*Pandion Haliaëtus*) also known as the FISH-HAWK, is a small species of the tribe of eagles, to the piscatorial accomplishments of which we have already alluded. Its peculiar adaptation for the capture of fish is evidenced by the structure of the lower surface of the toes, the skin of this part being formed into rough cushions, and each of the granulations of the skin terminates in a point or spine, which cannot but be of the greatest service to the bird in seizing upon the slippery struggling fishes which constitute its principal nourishment. It is a robust bird, with long and powerful wings, and a strong beak; the tarsi are short and stout, and their granular scales present an arrangement by which this bird and the other members of its genus may be at once recognized. The scales of the front of the tarsus are imbricated downwards, that is to say, the margin of each scale overlies the one below it; but on the back of the tarsus this arrangement is reversed, and the lower scales overlie those above them. The outer toe, also, is capable of being turned either forward or backward, an arrangement which must evidently assist the birds materially in overcoming their slippery prey.

The Common osprey measures about twenty-two inches in length; the general colour of its plumage on the upper surface and wings is dark brown, and on the lower surface white, with a few brownish feathers on the breast; the tips of the primaries are black, and the tail feathers are banded with two shades of brown. The beak is black, with the cere blue, and the feet are also blue, with black claws, which, unlike those of the rapacious birds in general, are not grooved beneath.

The osprey which is, at all events partially, a migratory bird, is found in almost all parts of the world, generally on the sea-coast, but frequently also on the banks of lakes and rivers far inland. It occurs abundantly on the shores of North America, and is almost equally plentiful in Europe; it is also an inhabitant of Northern Asia, and extends its range southward as far as India in the eastern, and Honduras in the western hemisphere. It appears to reside in the temperate and colder climates during the summer, and to move into a milder atmosphere as the approach of cold weather threatens to deprive it of its food, either by freezing up the waters, or preventing the fishes from coming so freely to the surface. Its habits appear to be everywhere much the same. Sailing gently along, at a considerable height above the surface of the water, it keeps a watchful eye upon the proceedings of the fishes beneath it, and the moment one of them comes near enough to the surface to render its capture possible, the wings of the osprey are immediately closed, and it descends, as described by Wilson, "like a perpendicular torrent, plunging into the sea with a loud rushing sound, and with the certainty of a rifle." Rarely is the attempt made in vain; in a few seconds the osprey emerges again from the water with his prey struggling in his talons, from which, however, there is no escape, and shaking the water from his plumage he sails slowly to the shore. In this way the osprey often captures and bears to land a prey considerably exceeding himself in weight, and the American ornithologists describe the bird as exhibiting great ingenuity when the wind is off the shore, in tacking about so as to avoid flying directly against it. Occasionally the osprey is said to vary his fish-diet by capturing water-fowl, but this seems to occur but rarely.

The nest is composed of an immense mass of rotten sticks and similar materials; it is generally placed in a high tree, but sometimes upon rocks, ruined buildings, or even on the ground. In this the female deposits two or three eggs, of a white colour, blotched with reddish-brown at the large end. The female sits almost continuously, the male supplying her with food during the periods of incubation, and after the young birds are hatched, which is usually in the month of June, the parents are indefatigable in feeding them, until, or even after, they are able to provide for themselves.

THE INDIAN OSPREY (*Pandion Ichthyaëtus*) is a nearly-allied species, first discovered by Dr. Horsfield in Java, where it frequents the borders of lakes and large rivers. It is also found upon the continent of Asia, as far north as Nepaul, and is known in Bengal by the name of *Fish-tyrant*. In its habits it closely resembles the common osprey, and lives exclusively upon fish, never, according to Dr. Horsfield, attacking fowls or other animals.

THE WHITE-HEADED OSPREY (*Pandion leucocephalus*) is a generally-distributed, although not an abundant species in Australia, where it follows precisely the same mode of life as its European congener, from which it is readily distinguished by having the whole crown of the head white. The nest is composed of sticks, some of them as thick as a man's wrist, and lined with sea-weeds. It is of enormous size—one measured by Mr. Gilbert being fifteen feet in circumference—and is placed either upon a rock, or amongst the branches of a high tree. The eggs are two in number, yellowish or white, blotched with reddish or purplish brown.

THE PONDICHERRY EAGLE (*Haliastur Indus*) is a very common and conspicuous species in India, where it is known to Europeans as the "Brahminy kite," the former name being in allusion to its being regarded with superstitious feelings by the Hindoos, and the latter to the resemblance of its habits to those of the kites. It is said to be sacred to Vishnu, and one of its Hindoo names signifies that it is "Shiva's kite;" another native name is the "Washerman's kite," and a third, which is interpreted the "Lucky-faced," is evidently in allusion to a superstition prevalent among the Mahometans, that "when two armies are about to engage, the appearance of one of these birds over either party prognosticates victory to that side."—(*Pearson.*) This bird is found not only on the peninsula of Hindostan, but also in the regions to the east of this, and in the islands of the Indian Archipelago.

The Pondicherry eagle is a small species, measuring scarcely twenty inches in length; its plumage is chestnut-brown on the upper part, and white streaked with brown on the lower. The beak is ash-coloured, with a bluish cere, and the feet yellow, with black claws. The beak, feet, and claws are much weaker than in the ospreys; the front of the tarsus is covered with large hexagonal scales, and the upper surface of all the toes is occupied by broad plate-like scales.

Its flight is described as greatly resembling that of a kite, except that the motion of the wings is rather more frequent. It is seen constantly sailing over the tanks, rice-fields, and rivers, at a moderate height, often passing up and down the course of a river, ready to pounce down in a moment at any unlucky fish that may make its appearance at the surface of the water. It usually snatches up its prey from the surface without immersing itself, but occasionally it dips entirely under water, when it seems to experience some difficulty in rising again with its prey. Besides fishes, this bird feeds upon many other inhabitants of the waters, such as frogs, insects, and crustacea, and, according to some observers, will also seize upon young birds.

THE WHISTLING EAGLE (*Haliastur sphenurus*), or WHISTLING HAWK of the Australian colonists, is an abundant bird in all parts of New Holland, where it inhabits alike the sea-coasts and the scrubs and swamps of the interior. It obtains its name from its emitting a shrill whistling cry when flying. Its plumage is of a brown colour, pale beneath and dark on the back and wings, the feathers of the latter parts being margined with greyish white; the bill and cere are greyish, and the feet bluish, with black claws. The tail is long and wedge-shaped, and the whole length of the bird is about two feet.

The Whistling eagle feeds upon carrion, small quadrupeds, birds, reptiles, insects, and fish, but does not appear to display any of the energy which characterizes the proceedings of some of the preceding species, in its pursuit of the last-mentioned prey. It is said by Mr. Gould to be destructive in the poultry yards of the colonists; but, on the other hand, it repays much of the injury thus done by destroying vast numbers of caterpillars, which frequently descend in armies upon the cultivated lands, and threaten to carry desolation with them. The birds are generally seen in pairs; their nest is constructed of sticks and fibrous roots, usually in the branches of a tall tree; and in this the female lays one or two eggs, of a bluish-white colour, with a slight tinge of green, upon which a few brownish markings are obscurely perceptible.

FALCONS.

We now come to the consideration of the True or *noble* Falcons, as they were formerly called, from the circumstance that nearly all the species of birds employed in the favourite ancient diversion of hawking belonged to this group. These Falcons are distinguished from all the other birds of prey, by having the margins of the upper mandible not merely sinuated, but armed with an acute tooth on each side not far from the apex. The other species of the family Falconidæ were denominated *ignoble* birds of prey, partly from their deficiency of courage, as compared with the True Falcons, and partly from the intractability displayed by most of them, which rendered them unfit for the purposes of the falconer. Arbitrary as this distinction seems, there is no doubt that the True Falcons, to a great extent, deserve the epithet noble thus applied to them; there is an elegance in their port and a boldness in their aspect which distinguishes them at a glance from most other birds of prey, whilst their astonishing power of flight and great muscular strength render them the types of predaceous birds.

Before proceeding to describe any of these birds, it may not be amiss to furnish the reader with a brief sketch of the mode in which the hawks are trained and used in falconry. When they can be taken from the nest, their training is comparatively easy; they are kept in sheltered habitations in the open air, and fed every morning and evening with beef or mutton cut into shreds, until they are about six weeks old, when their predatory instincts begin to show themselves, in the capture of any weak animals that come within their reach. They are then captured, their feet are confined with leathern manacles, called *jesses*, by which they can be fastened down in the dark prison to which they are transferred, and their heads are covered up in hoods, which effectually prevent their seeing what is taking place around them. The nestling birds are denominated *niais* in the language of falconers; older hawks which are able to leave the nest, but can only hop about, are called *branchers;* they are simply manacled and placed in a dark prison, in the same hooded condition as the *niais*, and their training presents little more difficulty.

But when an adult falcon has been caught, the affair assumes a very different complexion, for he does not resign his desires of freedom without a long struggle. The falconer, having first of all secured his prisoner's feet by means of the leathern jesses above mentioned, to which little bells are usually attached, takes the hawk upon his gloved fist, and keeps him awake and without food in a dark place until exhaustion begins to break his spirit. When the falcon is very obstreperous and attempts to use his beak, he is treated with a bath of cold water; but, notwithstanding these rigorous measures, it usually requires three days and nights to bring him into a state of proper submission. His head is then covered with a hood, and he is by degrees brought to feed freely, his strength being at the same time kept down by the administration of little pellets of hemp, which have a purgative effect. When the bird takes his food without difficulty, he is induced to leap upon the hand by holding up his meat, with which he is then fed, and afterwards his food is given to him upon a rude representation of a bird, called the *lure*, to which he is thus attracted from gradually increasing distances, being held all the time by a cord or string. When he becomes familiar with the lure, by associating it with his meals, he will pounce down upon it from almost any elevation. He is then taught to know his game, still kept from making his escape by means of a cord, and at last, when sufficiently trained, is allowed to fly freely in pursuit of birds and other animals. The training of the Gyrfalcon is the most arduous of all, the preliminary exercises occupying a great deal of time; the Peregrine Falcon is more docile, but even its training will require a month.

The sport of falconry, which was so great a favourite with our ancestors, has now fallen into almost total desuetude in European countries; but in the East, especially in Persia and India, it is still followed with great zeal. There, as in Europe in former days, it is one of the favourite diversions of the princes and great men, and numerous species of hawks and falcons are trained for it with great care.

THE GYRFALCON (*Falco Gyrfalco*), also called the *Jerfalcon* and the *Iceland Falcon*, is found in the northern parts of both hemispheres, but is most abundant in North America. It is a native of this country, but has become exceedingly rare here of late years; in fact, most of the British specimens must be looked upon as stragglers from the more northern countries of Iceland and Norway, where these birds occur in greater abundance. If we may judge from the high value placed upon the Gyrfalcon in the days when hawking was a fashionable amusement, and the sums expended in importing them from Iceland and Norway, we may justly come to the conclusion that this bird was never common in Britain. The Iceland falcons were greatly preferred to the Norwegian specimens, their strength and courage being described as greater, and their flight more rapid and bold. Hence the falconers generally considered that the two birds belonged to distinct species, but this view is not adopted by naturalists.

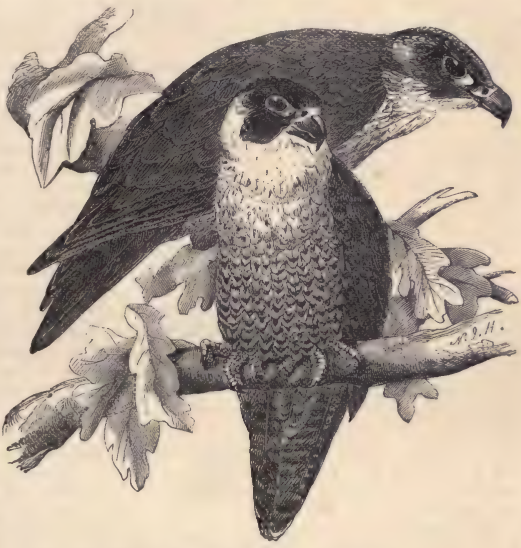
The Gyrfalcon measures from twenty to twenty-three inches in length; its plumage is of a white colour, while the whole of the back is marked with greyish-brown spots; the bill is bluish, the cere and feet yellow, and the claws black, exceedingly sharp, and much curved. The young birds are brown, and the white colour gradually encroaches upon this at each moult, until in the adults the whole brown surface becomes pure white, whilst the feathers of the back and wings retain the spots above mentioned. In very old birds even these disappear, when the plumage becomes nearly pure white. In a wild state, as observed by Sir John

Richardson, in the Hudson's Bay territories, "its habitual prey is the ptarmigan, but it also destroys plover, ducks, and geese;" from its great strength and courage it was employed by falconers in the pursuit of the largest quarries, such as cranes, storks, and herons.

The breeding places of the Gyrfalcon are all in the high northern latitudes; the best known are the rocky coasts of Norway, Iceland, Greenland, and Labrador. Mr. Anderson, who observed the nest in the latter country, describes it as "composed of sticks, seaweeds, and mosses, about two feet in diameter and nearly flat." In defence of its young the Gyrfalcon exhibits great courage, as is shown by the following anecdote related by Sir John Richardson:—"In the middle of June, 1821," says that distinguished naturalist, "a pair of these birds attacked me as I was climbing in the vicinity of their nest, which was built on a lofty precipice on the borders of Point Lake, in latitude 65½°. They flew in circles, uttering loud and harsh screams, and alternately stooping with such velocity that their motion through the air produced a loud rushing noise. They struck their claws within an inch of my head. I endeavoured, by keeping the barrel ot my gun close to my cheek, and suddenly elevating its muzzle when they were in the act ot striking, to ascertain whether they had the power of instantaneously changing the direction of their rapid course, and found that they invariably rose above the obstacle with the quickness of thought, showing equal acuteness of vision, and power of motion."

THE PEREGRINE FALCON (*Falco peregrinus*) is the next in point of size to the gyrfalcon amongst the European species of this group; it is a far more abundant bird in all the countries which it frequents, and especially in Britain. It has been noticed breeding on many parts of the coast of these islands, from the Isle of Wight to the Orkneys and Shetlands; it occurs, like the gyrfalcon, over the northern parts of both hemispheres, but extends its range much further to the south, being well known in the United States, the south of Europe, and in India, whilst its occurrence has been recorded by good naturalists even at the Straits of Magellan, the Cape of Good Hope, and in Australia. Mr. Gould, however, regards the Australian bird as a distinct species, which he has described under the name of the Black-cheeked falcon (*F. melanogenys*).

Fig. 100.



The Peregrine Falcon (Falco peregrinus.)

The Peregrine Falcon usually measures from fifteen to eighteen inches in length; the plumage of the top of the head and the back of the neck is nearly black, and a spot of the same colour occurs on the cheeks beneath the eyes; the back is of a bluish-ash colour, with darker bars; the primaries are brownish-black, with whitish spots on the inner webs; the front of the neck is whitish, spotted with brown, and the rest of the lower surface greyish-white, with numerous dark brown bars; the beak is blue, with a blackish tip and a yellow cere; the feet are also yellow, with acute black claws. The female of this most elegant of the falcon tribe is considerably larger than the male; she was more highly valued by the old falconers, by whom the name of *falcon* was especially devoted to her, the male being called a *tiercel* or *tiercelet* (sometimes corrupted into *tassel*), from his being as they said one-third smaller than his partner. From their docility and beauty the Peregrines, notwithstanding their comparative abundance, were always great favourites with the falconers; their qualities were studied with the greatest enthusiasm; their persons and nests were protected by legislative enactments; and an extravagantly high value was set upon those which combined in the highest degree the qualities most in request. Thus, we are told, that in the reign of James I., one Sir Thomas Monson paid a thousand pounds (an enormous sum in those days) for a single cast (or couple) of these hawks. The female of falcon, as she was termed, was flown at quarries of large size and considerable strength, such as herons, ducks, and wild geese, and from her great strength and courage was well adapted for this pursuit. Sir John Sebright, the great modern authority upon hawking, gives the following interesting account of the chase of the heron as practised in Norfolk:—He says, "The herons go out in the morning to rivers and ponds at a very considerable distance in search of food, and return to the heronry towards the evening. It is at this time that the falconers place themselves in the open country, down wind of the heronry; so that when the herons are intercepted on their return home, they are obliged to fly against the wind to gain their place of retreat. When a heron passes, a cast of hawks is let go. The heron disgorges his food when he finds he is pursued, and endeavours to keep above the hawks by rising in the air; the hawks fly in a spiral direction to get above the heron, and thus the three birds frequently appear to be flying in different directions. The first hawk makes his stoop as soon as he gets above the heron, who evades it by a shift, and thus gives the second hawk time to get up and to stoop in his turn. In what is deemed a good flight this is frequently repeated, and the three birds often mount to a great height in the air. When one of the hawks seizes his prey, the other soon *binds to him*, as it is termed, and, buoyant from the motion of their wings, the three descend together to the ground with but little velocity. The falconer must lose no time in getting hold of the heron's neck when he is on the ground, to prevent him from injuring the hawks. It is then, and not when he is in the air, that he will use his beak in his defence." From this animated description of the scene, the sportsman will probably sympathize with the enthusiasm for this diversion exhibited by our forefathers. Indeed one can imagine few scenes of a more exciting nature.

In a wild state the Peregrine Falcon tyrannizes unmercifully over all the weaker part of the feathered creation. In most districts grouse and partridges seem to constitute his favourite food, and it is at such game as this that the male or tiercel is trained to fly; but when the Peregrine has his dwelling-place in the vicinity of water frequented by aquatic birds, he preys freely upon these, pouncing down upon them whilst swimming peacefully on the surface of the water, and carrying them off in his talons with the most astonishing address. Rabbits and leverets are also frequently destroyed by these falcons. Their boldness is such that they have even been known to strike grouse sprung by the sportsman's dogs, before the birds had risen high enough to be shot at, and in several cases wounded birds have been carried off by them.

The Peregrine Falcon usually builds its nest amongst the nearly inaccessible rocks and cliffs of the sea-coast, but is also known frequently to select an inland station for this purpose. The nest, which is composed of sticks and dried plants, is a bulky structure, and in it the female lays three or four eggs, of a dull light-red colour with darker spots.

THE SULTAN FALCON, (*Falco peregrinator*) called the *Shaheen* by the natives of Hindostan, is a species nearly allied to the Peregrine, to which it is even preferred for the purposes of falconry in India. It is found in all the Indian peninsula, and also in other regions of Asia, especially to the south-west, breeding amongst high rocky hills, usually in the vicinity of jungle or forest. In the wild state it feeds principally on partridges, quails, and similar game, and is also said to have a strong predilection for the paroquets which abound in India.

This falcon, according to Mr. Jerdon, is always trained for what, in falconer's language, is called a "standing gait;" that is to say, it is not carried on the hand until the quarry is started, and then thrown off; but is instructed to hover and circle at a considerable height in the air, above the heads of the hawking party, watching for the starting of the game, upon which it immediately descends with a fatal swoop. "It is a fine sight," says Mr. Jerdon, "to see this fine bird stoop on a partridge or florikin (*Otis aurita*) which has flushed at some considerable distance from it, as it often makes a wide circuit round the party. As soon as the falcon observes the game which has been flushed, it makes two or three onward plunges in its direction, and then darts down obliquely, with half-closed wings, on the devoted quarry with more than the velocity of an arrow." The birds best adapted for this sport are those bred in the vicinity of open country, as these acquire a greater strength of wing; the forest-bred birds adopt a more lazy mode of existence, perching quietly on the trees, and thus watching for their prey. The mode of capturing these and other falcons in India is peculiar. At the season when the young birds are known to be about, the falconers make their appearance in the district with a little apparatus called an *Eerwan*, which consists of a thin strip of cane, about equal in length to the expanse of wing of the falcon to be captured, and having its ends smeared with bird-lime for several inches. To the centre of this stick the falconers tie a living bird, usually a dove, the eyes of which are previously sewed up; this is let loose in sight of the falcon, which immediately pounces down upon it, smears his wings with the bird-lime, and falls to the ground.

THE JUGGUR (*Falco Jugger*) is another Indian species; and, indeed, the most abundant of the large falcons on the peninsula of Hindostan. It is, however, a heavier and slower bird than either of the preceding, and is consequently less valued by the falconers. It is principally flown at crows, and the dodges of the latter, when they find themselves the object of pursuit, are described as exceedingly amusing. They use every artifice to make their escape, taking refuge amongst horses, cattle, and vehicles, and even entering houses. Mr. Jerdon mentions a case in which one of these falcons struck a crow so close to a washerman's fire, where it had taken refuge, that the wing feathers of the falcon were burnt.

The Paddy Bird also affords great sport with the Juggur; it is always found feeding amongst cattle, and when pursued dodges its enemy with such dexterity that the hawk is not unfrequently foiled, and sometimes even trodden under foot. In a state of nature the Juggur differs somewhat from the preceding species; it is always met with in cultivated districts, building its nest in a tall tree. Its food consists of small birds, and it occasionally steals a chicken from the cantonments.

THE LANNER (*Falco lanarius*) is also allied to the Peregrine falcon. It is a native of Nepal and South-western Asia, from which countries it was formerly imported into Europe for the purposes of falconry. It also occurs in the eastern parts of Europe. This bird was often flown at kites, which its great strength enabled it to cope with; the Peregrine falcon, a smaller bird, being unequal to this contest. In France this chase of the kite was regarded as a royal amusement, and, from this circumstance, the kite is still described by some French writers under the names of *Milan royal* and *Milvus regalis*.

THE HOBBY (*Falco subbuteo*) is a small British species of falcon, closely resembling the Peregrine. It usually measures from twelve to fourteen inches in length; the plumage of the upper parts is greyish-black, or bluish-grey; the quill feathers of the wings are black, and those of the tail greyish-black, indistinctly barred with a lighter tint. The lower part of the body is yellowish-white, with dark brown patches; the beak is bluish, the cere greenish-yellow, the feet yellow, and the claws black. The Hobby has been met with in many parts of this country, to which it is a summer visitor, but is by no means an abundant British bird. It is found in all parts of the continent of Europe, and also occurs in Northern Africa, and probably in most parts of Asia, as specimens have been obtained from Siberia, India, and even from China. It usually inhabits wooded districts, where it builds its nest in a high tree. Its powers of flight are very great, its wings being so long as to reach beyond the end of the tail when closed. In a state of nature its favourite prey appears to consist of skylarks, in pursuit of which it manifests great perseverance, whilst the unfortunate lark exhibits wonderful dexterity in avoiding the fatal stoop of its pursuer. The Hobby is also sometimes trained to fly at larks, quails, and snipes. Besides small birds, it feeds upon small beetles; and Mr. Henry Doubleday found the stomachs of two specimens examined by him, filled with the common dung beetle (*Geotrupes stercorarius*).

THE MERLIN (*Falco æsalon*), the smallest of the Falcons inhabiting Britain, is usually regarded as a winter visitor to this country, although several instances are on record of its remaining here through the summer and breeding. It is, however, more abundant in the northern than in the southern parts of the British isles. On the continent of Europe it appears to be generally distributed; it extends its range in Asia as far as Nepaul; and specimens have been obtained in the fur countries of North America. According to Dr. Andrew Smith, it is also met with at the Cape of Good Hope. It measures only eleven or twelve inches in length; the plumage of the back is of a fine bluish-grey colour; the wing primaries are quite black; the lower parts are reddish, with brown patches and streaks. In the female the back is liver-brown, and the lower parts brownish-white. Notwithstanding his small size the Merlin is so courageous and powerful that he has been known to strike and kill partridges at least twice his own weight; blackbirds and thrushes, and other small birds, are his common prey; and he was formerly trained to pursue these for the amusement of his owners. In the palmy days of falconry the Merlin was the Lady's Hawk. Its nest, which is rude and scanty, is built upon the ground in rocky places, or amongst heath; the eggs are four or five in number, and of a mottled reddish-brown colour.

THE KESTREL (*Falco tinnunculus*), called the Windhover in some localities, is the most abundant of the British species of this family, occurring in all parts of the country in considerable numbers. It is also generally distributed on the continent of Europe, and extends in Asia as far as China, Japan and Java, and in Africa to the Cape of Good Hope. The length of this beautiful little Falcon is from thirteen to fifteen inches; the colour of the plumage of the back is a bright reddish fawn in the male, reddish-brown in the female, marked in the former with small triangular black spots, and in the latter with transverse black bars. The lower surface in both sexes is of a pale reddish fawn colour, with dark longitudinal streaks and spots; the tail-feathers are greyish, more or less distinctly barred, and exhibiting a broad transverse black band near the tips, leaving the tips themselves white; the beak is blue, the cere and feet are yellow, and the claws black.

The appearance of this pretty little Falcon must be familiar to most of us, as it is commonly sold in our markets, and may be seen almost everywhere hovering over the fields in search of its prey. When thus engaged, it may always be recognized by its movements. After advancing for a short distance, it suddenly remains perfectly stationary, suspended in the air by very short but rapid motions of the wings; and during this halt its sharp eye is carefully inspecting the ground beneath it in search of the small game which constitutes its favourite food. Should there be nothing stirring in one place, the bird moves on to another, and there resumes his inspection; but should a mouse or any other small animal make its appearance, the Kestrel closes his wings, and dashes down upon it instantly. It is from this habit that the bird has received the name of Windhover. His favourite food, for the capture of which the manœuvres above described are indeed specially adapted, consists of field-mice and other small Mammalia, amongst which he causes a great destruction, so that he is certainly to be regarded as a farmer's friend, and should be encouraged rather than persecuted; but unfortunately this bird is very commonly confounded with the Sparrow-hawk, and often suffers the punishment which the latter may perhaps deserve for his depredations in the poultry yard. The Kestrel does not, however, confine himself exclusively to quadruped game, but occasionally kills and devours small birds; insects and earthworms also form a part of his diet. Mr. Selby mentions, on the authority of an eye-witness, that a Kestrel has been seen late in the evening hawking after cockchafers. His informant says—"I watched him with a glass, and saw him dart through a swarm of the insects, seize one in each claw, and eat them while flying. He returned to the charge again and again." The nest is built among rocks, or on old towers and other ruins, and in some places in trees. Sometimes the Kestrel takes possession of the nest of a crow or a magpie, and adapts them to its own purposes. The eggs are four or five in number, of a reddish-white colour, mottled or blotched with reddish-brown.

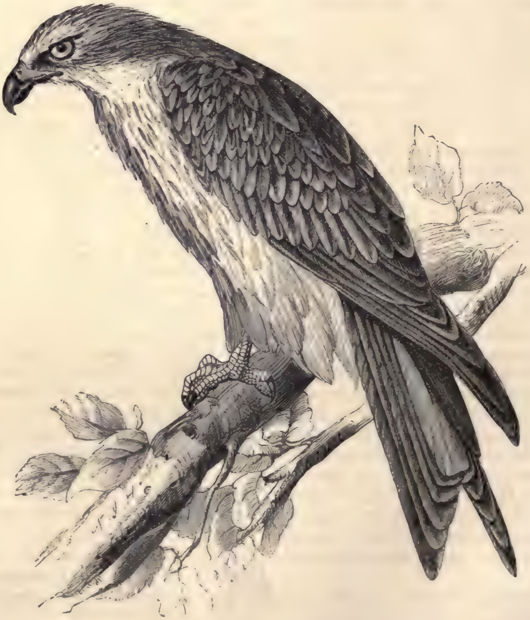
THE CREAM-BELLIED FALCON (*Falco Berigora*—Plate 2, fig. 5).—This species is generally distributed over Van Diemen's Land and Australia, where it is known to the colonists by the name of the *Brown Hawk*. It measures from fourteen to sixteen inches in length; its plumage is generally of a brown colour, but the throat and a large patch on the belly are pale buff. The bill and feet are of a light lead-blue colour, and the claws black. This bird, which is more sluggish in its habits than the majority of the true Falcons, is exceedingly abundant in the districts which it frequents, so that, as stated by Mr. Gould, from ten to forty of them may not unfrequently be seen reposing on a single tree, after securing their morning meal. Their food consists partly of carrion, partly of reptiles and insects; and it is not often that they prey upon birds or small Mammalia. The nest, which is about the size of that of a crow, is composed of sticks, and lined with strips of bark, leaves, &c.; it is built amongst the highest branches of lofty trees. The eggs are two or three in number, usually of a buffy white colour, blotched or mottled nearly all over with reddish-brown.

THE WHITE-NAPED FALCON (*Ierax eutolmus*). The genus *Ierax*, which is peculiar to the East Indies, includes the smallest species of the family Falconidæ; but, notwithstanding their diminutive stature, these little birds are by no means inferior in courage to the largest and strongest of their allies. Their talons are formed on the precise model of those of the larger falcons; their little beaks are strong and much hooked, and the margins of the upper mandible armed with large teeth, indicating predaceous propensities of the very highest order. These little falcons, often smaller than a thrush, are frequently trained by the Hindoos for the purpose of falconry, when they are flown at quails and other game of corresponding size. Captain Mundy describes the mode of flying this falcon in the following words:—"The mode of starting it is different from that used with any other hawk. The falconer holds the little well-drilled savage within the grasp of his hand; the head and tail protruding at either end, and the plumage carefully smoothed down. When he arrives within twenty or thirty yards of the quarry, the sportsman throws his hawk, much as he would a cricket ball, in the direction of it. The little creature gains his wings in an instant, and strikes his game after the manner of the Bhause (Goshawk)."

KITES.

THE COMMON KITE (*Milvus vulgaris*), although formerly very abundant in this country, is now of comparatively rare occurrence, especially in the southern parts of the kingdom, the gradual clearing of the extensive ranges of forest, which form his favourite retreat, having exposed him to be all but exterminated by the gamekeepers. The districts where the Kite is now most frequently met with, are the lake country of Cumberland and Westmoreland, and the south-western part of Scotland. On the continent of Europe it is not

Fig. 101.



The Common Kite (Milvus vulgaris).

uncommon, and extends eastward into Siberia; in the more northern regions, it is a summer resident, migrating southwards in the autumn.

The Kite measures from twenty-five to twenty-seven inches in length, including the long forked tail with which it is furnished. The general colour of the plumage of its back is reddish-brown, the feathers being dark brown with broad reddish edges; the head and neck are greyish, and the whole lower surface reddish-brown, as are also the tail feathers. The wing primaries are black. The beak is horn colour, the cere and feet are yellow, and the claws black. The wings of the Kite are very long, and of immense extent as compared with its body, and from this circumstance and the great power of the tail, the flight of the bird is singularly graceful and easy. The extended wings seem to have the power of supporting their owner in the air almost without the least exertion: it glides smoothly along without effort, now rising gently, now descending, to use the words of Buffon, "as if sliding upon an inclined plane," now wheeling round in graceful circles, and all with scarcely a perceptible movement of the wings, but simply by the action of the rudder-like tail. From this beautiful gliding motion no doubt, the Kite has in some districts received the name of the *Gled* or *Glead*, which has probably survived from the days of our Saxon ancestors. During his graceful evolutions, however, the Kite has usually his eyes steadily fixed upon the ground beneath him, with which he seems to have so little to do; and the moment his prey makes its appearance in the shape of a mole, a mouse, a young rabbit or leveret, or any other small terrestrial animal, the long wings are closed in an instant, and the Kite descends with astonishing velocity upon his devoted quarry. Lizards, frogs, and snakes constitute a portion of the food of the Kite, and he has been seen to capture fish with great address. In some countries he takes his share of carrion with the other feathered scavengers; and in London, in the reign of Henry VIII., there were, as we are told by Clusius, vast numbers of kites always on the look-out for the offal, with which the streets of the city were polluted. He appears rarely to pursue birds upon the wing, but the young of the gallinaceous birds not unfrequently fall victims to his talons, and chickens are sometimes carried off by him from the poultry yard, although the hen by her vociferations and show of resistance sometimes succeeds in driving off the cowardly plunderer. In fact, the courage of the Kite seems to be of very low quality, for he allows himself to be attacked and even brought down by the Sparrow-hawk, without making much show of resistance. In France, as already mentioned, the Kite was pursued by falcons for the amusement of the king; and the same sport has been followed in our own country, as recorded by Sir John Sebright. The Kite was attracted towards the ground by means of a great owl, to the leg of which a fox's brush was usually attached; this was thrown up into the air within sight of the Kite, and the latter, no doubt wondering what strange creature this was, would gradually advance within the proper distance of the hawking party. The owl, having been previously trained, was then brought down to the lure, and a cast of hawks thrown up in pursuit of the Kite. In captivity the Kite is said to become very tame and familiar, and to display a most engaging amiability of disposition.

The nest, which is usually built upon the forked branch of a tree in the thickest part of a wood, is composed of sticks and lined with soft materials. It contains from two to three eggs, of a dirty white colour, with a few reddish-brown spots at the larger end. In defence of its nest the Kite seems to exhibit an unusual degree of courage, for Mr. Yarrell tells us that "a boy who climbed up to one had a hole picked through his hat, and one hand severely wounded, before he could drive away the parent bird."

THE BLACK KITE (*Milvus niger*), an inhabitant of the south of Europe and of Africa, is still more remarkable as a scavenger than our British species. It is exceedingly abundant in Abyssinia, where it is constantly seen clearing the streets and compounds in company with crows. But the most extraordinary part of the character of this bird is its wonderful impudence. It frequents the towns and cities of the East in great abundance, and will descend upon chickens, and carry them off from under the very noses of their owners, or even snatch away food from the hands of men and women. Dr. Petit mentions his having seen one of these birds at Cairo carry off a piece of bread and cheese from an Arab woman as she was in the act of putting it into her mouth; and on another occasion, as a black boy employed by him in preparing birds was engaged upon the skin of a pigeon, a kite descended upon him, tore away the head of the bird, which alone contained any flesh, and left the skin in the hands of the astonished young taxidermist.

THE GOVINDA KITE (*Milvus Govinda*), an inhabitant of India, and apparently of the entire southern part of the Asiatic continent, agrees very closely with the Black Kite in its habits, having an equal predilection for carrion and an equally bad character as an impudent robber. These birds will descend upon garbage in the most crowded streets, and often seize it in their talons at the moment of its being thrown out and before it reaches the ground; and, according to Colonel Sykes, they will even occasionally stoop upon a dish of meat on its way from the cook-room to the house.

THE BLACK-WINGED KITE (*Elanus melanopterus*) is a small species of this group, which appears to be spread over nearly the whole of the warmer part of the Old World. It is abundant in India and the islands of the Eastern seas, and in Africa from Egypt to the Cape of Good Hope; specimens also occur, although rarely, in the south of Europe. Its colour is an ashy grey on the upper parts, becoming nearly black on the wings; the whole inferior surface is pure white. It feeds principally upon insects, which it often whips up with great address from the ears of standing grain in the fields; in some places it preys freely upon mice, pouncing down upon these small quadrupeds with the rapidity of lightning. Although it sometimes kills and devours small birds, it does not usually capture them on the wing, but seizes them when on the ground or the branch of a tree. Its mode of flight, when hunting for food, is compared to that of the Harriers (*Circus*). The nest is built in the forked branch of a tree, and lined with moss and feathers; it usually contains four or five eggs.

THE SWALLOW-TAILED KITE (*Nauclerus furcatus*) is a handsome bird, inhabiting the warmer regions of America, where, however, it seems to be a bird of passage. Two specimens have been taken in Britain, and hence it figures in our British Ornithologies as an occasional visitor. It may be at once distinguished by the great length of its very deeply-forked tail, which exactly resembles that of the swallow; its wings also are extremely long and pointed, and the bird is evidently constructed with a view to great activity in the air. The head, neck, and the whole of the lower surface of the body are snow-white; the whole of the back, the wings, and the tail feathers are deep black, glossed with a metallic purple lustre—a contrast of colour which gives the bird an elegant appearance. In the air its movements are most graceful, and it spends most of its time on the wing, capturing the insects on which, like its analogues the swallows, it principally feeds. In fact nearly the whole business of its life goes on in that element, for which it is so pre-eminently fitted; here the courtships take place between the newly-mated pairs, and here it devours all its prey, even carrying off the lizards and small snakes, which constitute a portion of its food, to eat them while sailing through the air. The Swallow-tailed Kite breeds in the southern states of the American Union, building a nest of dry sticks and moss, lined with grass and feathers, in the highest branches of the tall oaks and pine trees. In this the female lays from four to six eggs of a greenish-white colour, upon which the parents sit alternately, feeding each other while thus engaged.

HAWKS.

THE SPARROW-HAWK (*Accipiter Nisus*), one of the most abundant of our British hawks, is also found commonly not only in most parts of Europe, but also in Asia, as far east as Japan, and in the northern parts of Africa. The male and female in this, as in most other species of the group of Hawks, differ greatly in size; the former measuring only about twelve inches in length, whilst his partner is fifteen. The general colour of the plumage consists of different shades of brown, richer in the male than in the female; in the former the lower surface of the body, from the chin to the tail coverts, is reddish, with many transverse bars of reddish brown; in the female the same parts are greyish-white, with brown bars; a somewhat similar difference of colour prevails in the tail feathers of the two sexes.

The Sparrow-hawk is exceedingly elegant in its form, and active in its habits, its long wings enabling it to fly with great rapidity, whilst its broad and powerful tail renders it capable of performing the most astonishing evolutions with ease. When hunting for its prey, it usually glides swiftly along at a height of only a few feet above the fields, occasionally passing up one side of a hedge and down the other, its bright eye always watching for an opportunity to dart upon its victim. It sometimes pursues birds upon the wing, but usually pounces down upon them when resting either on the ground or on the branch of a tree or bush, and its descent upon its quarry is performed with the most surprising celerity. Mr. M'Gillivray mentions his having seen a Sparrow-hawk "rush headlong into the midst of a dense thicket, and suddenly emerge on the other side carrying off a thrush in his talons;" and he adds, "How a bird at its utmost speed could thread its way between branches and twigs seems almost incredible." But the Sparrow-hawk does not always content himself with a diet of small birds and field-mice; young rabbits, leverets, and partridges are often destroyed by him in the fields, and occasionally he pays a visit to the habitations of man, and carries off chickens from the poultry-yard or pigeons from the dovecot with the utmost audacity. Even the presence of man does not at all interfere with the predatory plans of this daring little marauder; he skims along at a little distance from the ground, snatches up his prey in an instant, sometimes almost from under people's feet, and dashes off with it before an alarm can be given. When taken young the Sparrow-Hawk may be trained to hawking; he may be flown at partridges early in the season, and, according to Sir John Sebright, "is the best of all the hawks for landrails." In rearing the young, the sexes must be separated very early, otherwise the females, being larger and stronger, will kill and devour the males.

The nest of the Sparrow-hawk is usually built in a tree, but in some of the Hebrides, where trees are wanting, the bird builds among the rocks. The nest is nearly flat, rudely composed of sticks and twigs, with a little grass, moss, or wool in the centre for the reception of the eggs, which vary from three to five in number, and are of a bluish-white colour, with dark-brown blotches and spots. Very often this hawk does not take the trouble to build a nest, but seizes upon the deserted dwelling of some other bird, usually a crow.

THE STREAKED SPARROW-HAWK (*Accipiter virgatus*) is an Indian species, which, although not common, is much used and highly prized by the native falconers. It is an inhabitant of the forests, and is employed for hawking in jungly districts, for which its habits specially adapt it.

THE AMERICAN BROWN HAWK (*Accipiter fuscus*), which is found abundantly in many parts of the United States, especially those bordering the Atlantic, is an active and elegant bird, which seems in its boldness to represent our sparrow-hawk on the North American Continent. It is described by Wilson as dashing through the air with extraordinary velocity, often in a zig-zag course, as if for the purpose of seizing its prey by surprise. It feeds upon small birds, quadrupeds, and lizards; and as an example of its activity in pursuit of prey, Wilson mentions his having shot a specimen which had in its talons a small lizard, whose lightning-like rapidity of movement is so remarkable as to have obtained for it the name of the Swift.

THE GOSHAWK (*Astur palumbarius*).—The Goshawk is the only species of this group, besides the sparrow-hawk, found in Britain, where, however, it is very rare. On the continent of Europe it is in many districts not uncommon. It occurs in many parts of Asia; and in India, where it is called the *Bhause*, is employed in falconry. It also inhabits the north of Africa, and the United States of America. It is rather a large hawk, the full grown female measuring about two feet in length, whilst the males are often one-third less; the plumage of the upper parts is brown and that of the lower surface nearly white—spotted, barred, and lined with black; the tail feathers are barred transversely with light and dark brown; the beak is horn-colour or bluish-black, the cere and feet yellow, and the claws black.

In its general habits the Goshawk resembles the sparrow-hawk; but its greater size and strength render it formidable to game of larger size than can be attacked by that bird. Its flight is low, but rapid and gliding, and it pursues its quarry with great pertinacity, even through woods and thickets—a quality which formerly rendered it a great favourite with falconers. The game at which it was flown consisted of pheasants, partridges, grouse, ducks, and even herons, amongst birds; and hares and rabbits, amongst quadrupeds: it pursues these in direct flight, not attempting to rise above them in order to pounce down like the peregrine and other falcons. When baffled by its quarry taking refuge in a thicket through which it cannot penetrate, it will perch upon the branch of a tree, and wait patiently until the game begins to move, when it immediately starts in pursuit. The nest of this bird is usually built in a high tree near the borders of a forest, and the same nest frequently serves for several years in succession. The eggs are three or four in number, and of a pale bluish-white colour.

THE NEW-HOLLAND GOSHAWK (*Astur Novæ Hollandiæ*), a fine species, rather smaller than the preceding, found principally in the colony of New South Wales, is remarkable for the pure white colour of most of the specimens, only a few being occasionally met with in which the back is grey, and the feathers of the chest marked with brownish transverse lines. The grey birds are peculiar to New South Wales, but the white specimens not only occur in that colony, but also in Van Diemen's Land.

THE AUSTRALIAN GOSHAWK (*Astur approximans*) is a far more abundant species than the preceding, although occurring principally in the same range of country. The general colour of its plumage is brown, with numerous narrow transverse greyish bands on the lower surface. It is an active, bold, powerful, and sanguinary species, destroying great quantities of small birds, quadrupeds, and reptiles. Its nest—which is of large size, built with sticks, and lined with leaves of the gum-tree—is usually placed amongst the boughs of a large swamp oak (*Casuarina*), and commonly contains three eggs of a bluish-white colour, covered with patches of brownish buff.

THE CHANTING FALCON (*Melierax musicus*), an inhabitant of the southern parts of Africa, is remarkable in the whole series of birds of prey for the possession of a musical voice. It is a bold, active, and sanguinary bird, waging an incessant war of destruction with all the smaller inhabitants of the forest, in which it takes up its abode, usually near the course of a river. Its song, according to Le Vaillant, is heard principally during the breeding season, when the male perches by the side of his mate up on the summit of a high tree, or in the vicinity of the nest where she is engaged in incubation, and pours out his feelings in melody for hours together, particularly about sunset and sunrise.

SERPENT-EATERS.

THE SECRETARY-BIRD (*Serpentarius reptilivorus*), —Plate 3, fig. 8—the only known species of this group, has been placed by different writers in the most various positions in the classification, for which, indeed, its remarkable structure may furnish some little excuse, although it can hardly justify those who have made the greatest blunders. The Secretary-bird or Serpent-eater is distinguished from all other predaceous birds by the extraordinary length of its legs, which give it an aspect somewhat similar to that of a wading bird of the order *Grallæ*, amongst which some authors have not hesitated to arrange it; although one would think that a glance at the feet and bill would have sufficed to convince any ornithologist that this could not be its proper place. Others have assigned it a position amongst the gallinaceous birds, a view which is equally untenable. In fact we have only to examine the general character of the bird to become convinced that it is simply a long-legged species of the predaceous order; and when we come to inquire into its habits and mode of life, we shall soon see that this peculiarity of its conformation is strikingly in accordance with its duties in nature. It has sometimes been called the Secretary Vulture, and placed in the family Vulturidæ, for what reason it is hard to say; and the majority of modern naturalists are agreed in arranging it in the present family, of which it forms a subordinate group, most nearly allied to the Hawks and Harriers, and in some respects intermediate between those two groups.

The Serpent-eater is a large bird, attaining a height of more than three feet when standing with its head raised. Its plumage is of a bluish ash colour above, and of a greyish white beneath; at the back of the head is an elegant tuft of long black feathers, which the bird possesses the power of elevating or depressing at pleasure; and it was from a fancied resemblance of this tuft to the pen of a clerk, stuck in a business-like fashion behind his ear, that the old Dutchmen who first saw this curious bird gave him the name of the Secretary. The tail is composed of long flexible feathers, of which the two middle ones are much longer than the rest, and nearly reach the ground; and the whole of these feathers are variegated with black and grey, and tipped with white. The great length and slenderness of the legs have been already alluded to; these characters indicate that the bird is constructed especially for walking and running on the ground, and in accordance with this destination we find the toes comparatively little developed, the hind one in particular being very small, and the foot, like that of the Vultures, is incapable of grasping and carrying off a prey.

All these peculiarities co-operate in adapting the Secretary-bird to its place of abode and mode of life. It is found upon the dry plains of Southern Africa, where it wages an incessant and deadly war with the infinite multitude of snakes and reptiles of all kinds with which that region abounds. And here we have to notice another peculiarity of this singular bird—a further adaptation to its particular calling of snake-destroyer. Its wings, which are of large size, and covered with strong quill feathers like those of most Falconidæ, are further armed with blunt but strong spurs at the wrist joint, and these wings the bird holds before him like a shield, keeping them in continual agitation—*sparring*, as it were, as he advances sidelong towards his intended prey. His long legs, which enable him to run with rapidity, also give him a great advantage in this mode of attack, by raising his head to a safe height from the ground, and as he gradually approaches the snake, he watches carefully for the moment when the latter is about to spring upon him, and to fix its poisonous fangs in some vulnerable part of its adversary's body. But this is usually a vain attempt; as the reptile dashes upon its enemy, a sudden and most violent blow from the bird's armed wing throws him writhing upon the ground, and this process is repeated if the snake be strong enough to return to the attack. After reducing his foe to a helpless condition by these tremendous blows, the bird, like a victorious gladiator, proceeds to despatch his opponent, whom he swallows whole if of convenient size, or tears to pieces if too large to be disposed of at a single gulp. He has sometimes been seen to carry up a snake, which refused to die easily, to a great height in the air, and then let him fall to the ground. Some notion of the voracity of this bird, and of the benefits which he unconsciously confers upon the inhabitants of a region so overrun with reptiles as Southern Africa, may be obtained from a statement of Le Vaillant, to the effect that he found in the crop of a Secretary eleven good-sized lizards, three snakes of the length of a man's arm, and eleven small tortoises, besides a considerable number of insects. It is no wonder then that the Secretary-bird is regarded as a benefactor by the inhabitants of his native country; and we find that he is not unfrequently domesticated at the Cape, and kept among poultry, partly for the purpose of destroying snakes, rats, and other injurious animals, and partly, it is said, with the view of keeping order amongst the other inhabitants of the yard. He is said to live peaceably with the latter, notwithstanding his accipitrine nature; although, if he is not properly supplied with food, he sometimes makes away with a chicken or two. The bird has also been introduced by the French into the colony of Martinique, with the view of keeping down the numbers of the terribly venomous *Fer-de-lance* serpent (*Trigonocephalus*).

The nest of the Secretary-bird is built of sticks in a thicket, usually in the highest part of the district inhabited by the birds. It is of large size, often three feet in diameter, flat, and lined in the centre with wool, hair, and feathers. The bird is said to have the art of arranging the branches of the bushes surrounding it, in such a way that their shoots speedily form a rampart round it, and conceal it most effectually. The eggs are two or three in number, and of a bluish-white colour, faintly spotted or clouded with brown.

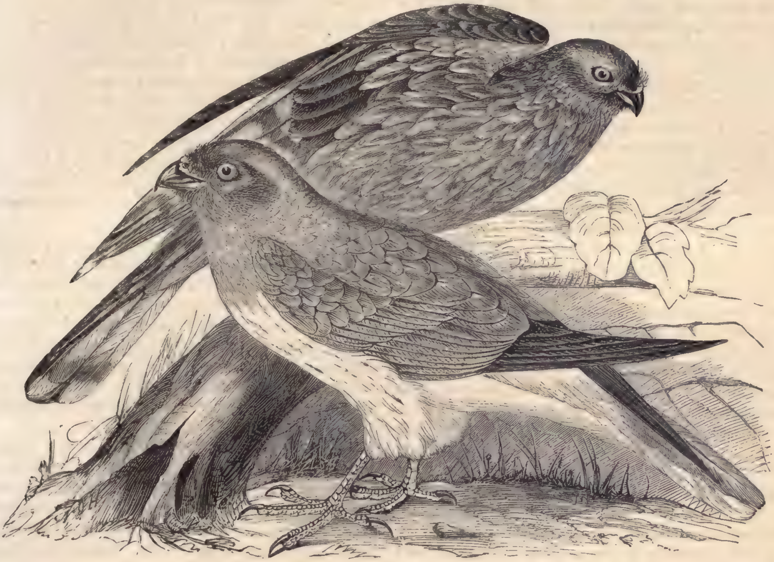
HARRIERS.

THE COMMON HARRIER (*Circus cyaneus*).—The group of hawks to which the name of Harriers is given, makes the nearest approach of all the diurnal predaceous birds to the family of the Strigidæ, or Owls. The characters which indicate this alliance are the softness of the plumage, and the greater size of the eyes and ears, accompanied, in some species, by a radiating arrangement of the feathers of the face, presenting a certain degree of resemblance to the well-known facial discs which give the owls such a curious staring aspect. The name of Harriers given to this group of hawks, is supposed to allude to their mode of seeking their prey; when thus engaged, they fly slowly along at but a little distance from the ground, apparently beating over every part of the surface, somewhat in the manner of a dog hunting for game.

The Common Harrier is generally distributed in Britain, although now, like most birds of prey, becoming far less common than it was but a few years back. It inhabits the temperate parts of Europe and Asia, but appears to become less abundant towards the north. Specimens have been killed in some parts of Africa, and a harrier occurs in North America which seems to be identical with the European species. The male of the Common Harrier measures about eighteen inches in length, and is of a light bluish-grey colour on the upper surface, with the primaries of the wings nearly black; the lower surface is ashy grey, becoming paler on the belly. The female, which is about two inches longer than her partner, differs from him completely in colouring, being of a uniform brown colour above, and reddish-buff beneath, whilst the lateral tail feathers are barred transversely with two shades of brown. From this latter character the female is sometimes called the Ringtail, or Ring-tailed Harrier. The wings in both sexes are about two inches shorter than the tail; the bill is black, the cere and feet are yellow, and the claws black.

This bird is usually found in flat, marshy districts, on low moors and commons. Its flight is buoyant and easy, and performed apparently with but little labour, so that it is admirably adapted for the peculiar mode of seeking prey adopted by the bird, as already described, which often necessitates its being on the wing for hours together. Its prey consists of small mammalia, such as young rabbits, leverets, rats, and mice, the smaller birds, and reptiles; upon these it pounces down suddenly when it spies them amongst the herbage on the ground, and its courage and strength are such that it does not hesitate to attack a partridge or grouse, and has even been known to seize upon a pheasant. Sometimes, but rarely, it will pursue birds upon the wing, probably when they rise from under its stoop.

Fig. 102



The Common Harrier (Circus cyaneus).

The nest of the Harrier is usually placed upon the ground, and rudely built with a few small sticks and pieces of coarse grass. In this primitive cradle the female deposits four or five eggs, which are of a white or very faint bluish colour.

THE MARSH HARRIER (*Circus æruginosus*), which is also frequently termed the *Moor Buzzard*, is another British species, rather larger than the preceding, the male usually measuring twenty-one and the female twenty-three inches in length. It is pretty generally distributed in this country, but by no means common in any locality; it occurs all over the continent of Europe, in the north of Africa, and in Asia as far as India. In its habits it agrees very closely with the common Harrier, but it is said to prefer preying upon aquatic birds—whence probably its name of the Duck Hawk—and also occasionally to capture fish.

MONTAGUE'S HARRIER (*Circus cineraceus*), a third British species, is a little smaller than the common harrier, from which it may also be easily distinguished by the great length of its wings, which reach quite to the extremity of the tail. The difference of colour in the two sexes is as great as in the common species. In this bird the radiating feathers of the face are more distinct than in the two preceding species, giving it a still more owl-like aspect, but the habits of the birds are precisely similar.

THE INDIAN HARRIER (*Circus Swainsoni*), which is found abundantly in many parts of India, presents a considerable resemblance in its habits to its English relatives, which, indeed, are also met with in the plains of Hindostan. It rarely perches on a tree, but frequents open places and cultivated ground, beating over the corn fields, and preying upon lizards, locusts, and mice, or occssionally on small birds.

THE BLACK AND WHITE HARRIER (*Circus melanoleucos*), another Indian species, frequents low, marshy, and inundated districts, feeding, in company with wading birds, on frogs, mollusca, and even on fishes.

THE AUSTRALIAN HARRIER (*Circus assimilis*), which is nearly allied to our Marsh Harrier, is an abundant species in New South Wales and the southern part of New Holland; it also occurs, though less numerously, in Van Diemen's Land. In its habits it resembles the Marsh Harrier, evincing a great partiality for marshy grounds and the vicinity of lagoons. Its prey consists of reptiles, and small mammalia and birds. Amongst the colonists this bird is known as the Swamp Hawk.

JARDINE'S HARRIER (*Circus Jardinii*), another Australian species, is remarkable for the great beauty of its plumage, which is of a fine chestnut colour generally, with the whole lower surface of the body and the shoulders elegantly spotted with white. The tips of the wings are nearly black, and the long tail is marked with alternate bars of blackish-brown and pale grey. Its habits exactly resemble those of the preceding species.

THE FROG-EATING HARRIER (*Circus ranivorus*), discovered by Le Vaillant at the Cape of Good Hope, is described by him as being so much addicted to that diet which is sometimes said to be also a favourite with his countrymen, that even the Dutch boors and Hottentots had given it the name of *Kikvors vanger*, or the "Frog-catcher." Gliding gracefully over the marshes and pools, this bird watches intently for the appearance of any unlucky frog amongst the reeds; and the moment he catches a glimpse of his intended prey he dashes impetuously down amongst the herbage, seizes his victim, and devours him on the spot. He also destroys water-fowl, especially when young, and appears sometimes to catch fishes. The nest of this species is made amongst the plants of the marshes frequented by it, and composed of fragments of their stems and leaves. The eggs are three or four in number, and, like those of all known Harriers, of a white colour.

FAMILY III.—STRIGIDÆ.

The nocturnal birds of prey, or those whose principal period of activity is the darkness or twilight, form only a single family, that of the Strigidæ, or Owls. These birds are distinguished from those of the preceding families by several sufficiently striking characters, the most prominent of which are undoubtedly those which bear a relation to their nocturnal mode of life. Thus, the plumage is very soft and downy, rendering the flight of the Owls perfectly noiseless, so that the birds are enabled to execute the most rapid manœuvres in the air without producing any flapping sound to give notice of their approach to the most wary of their prey. Their eyes are of very large size, with immense pupils, and consequently adapted to receive every ray of light that may be available for vision. These organs are placed in such a manner as to look almost directly forward, and not, as in the day-flying hawks and eagles, on the sides of the head. In both these particulars, as previously stated, the harriers make a certain approach to the owls; but these characters are exhibited by them in a far less distinct form than in the birds of the present family, and none of them are known to hunt their prey in the twilight. Of course this structure of the eye in the owls, however important to them in the imperfect light in which they are destined to be abroad, is by no means advantageous in broad day-light, and when exposed to the latter, they evince their discomfort in the most evident manner. In a strong light they can hardly see, but sit perfectly helpless and confused, staring in a most ludicrous fashion at the objects presented to them, and taking any opportunity of withdrawing into some obscure corner. The ears also are of larger size than in any other birds, and are usually furnished with a sort of lid to cover the large cavity in which they open.

The head is large, and there is no ridge over the eyes, as in the Falconidæ. The feathers of the face are somewhat hair-like in their texture, and are arranged in a radiating form round the eyes, constituting a peculiar disc of irregularly circular form on each side of the face. In some cases this disc completely surrounds the eye; in others the upper part of the face is clothed with ordinary feathers, and the peculiar feathers of the disc are only seen beneath and on the sides of the eye. The feathers of the face bordering the inner margin of the eye, which form the inner part of the facial disc, project more or less forwards, and conceal the base of the bill, which is short and hooked, and furnished with a naked cere.

The wings are rather short, broad, and rounded, indicating far less power of flight than is possessed by any of the hawks and vultures; but, on the other hand, the legs are stout and powerful, and armed with sharp claws, of which an eagle need hardly be ashamed. The whole of the tarsi and the toes nearly to their tips are generally clothed with feathers, which are usually of a hair-like texture. The outer toe in each foot is reversible, or capable of being turned backwards, in the manner of that of a parrot.

These birds are solitary in their habits, living in pairs in the holes of trees, rocks, old buildings, and other retired places, where they conceal themselves during the daytime, issuing forth in the evening to seek their prey. This consists principally of the smaller vertebrated animals, especially Mammalia, many of which are nocturnal. The smaller owls also feed frequently upon the insects, such as moths and beetles, which come abroad in the twilight, and the indigestible portions of all their prey are collected in the stomach into little pellets, which are then disgorged. Their voices are generally loud and discordant, and when heard in the silence of the night, have, no doubt, had much to do with the superstitious fear with which these birds are commonly regarded by the vulgar in most countries—a feeling probably enhanced by the noiseless flight of the bird, and its often frequenting the churchyards and other solitary places, such as ruins, which are regarded with a certain degree of awe by the ignorant and superstitious. We shall now refer to some of the more important species of this family, commencing with—

THE SNOWY OWL (*Surnia nyctea*)—Plate 4, fig. 12. —Although the birds of this family are generally characterized, as already stated, by their adaptation to a nocturnal mode of life, there are some whose organization enables them to bear the light of day, so that they can go abroad in search of their prey even when the sun is shining brightly. The most diurnal of these exhibit a striking approach in some of their characters to the hawks, and especially to the harriers; their heads and eyes are comparatively smaller than in the more typical owls, their facial discs are imperfect, and their ears are smaller and less complicated than in the strictly nocturnal species of this family. Hence these owls have been denominated Hawk Owls. Their adaptation to a diurnal activity is evidently in intimate connection with the necessities of their existence; they are, for the most part, inhabitants of those regions of both hemispheres which lie within, or close to, the arctic circle; and as, during the summer, there is little or no night in those latitudes, a nocturnal bird would be but ill adapted to get his living there at that season.

Of these diurnal species the Snowy Owl is a well-known example. It is generally distributed over the extreme northern parts of both hemispheres, descending more towards the south in the winter, when the inhospitable climate of the arctic regions would leave it but little chance of finding prey. In this way it visits the United States in the western, and Germany and Great Britain in the eastern hemispheres, but it is a very rare bird in this country. Nevertheless it would appear, that not very long since it was a permanent resident in the Shetland islands, building its nest and breeding amongst the rocky ledges of their wild hills.

The Snowy Owl is one of the largest species of this family; the male measuring twenty-three, and the female twenty-six inches in length. It has a rather long and rounded tail; its plumage is white, with the back spotted, and the wings, tail, and lower surface barred, with dusky brown. These brown marks are larger in the females and young birds than in the males. The feet are thickly clothed with white feathers to the extremities of the toes, which are armed with strong black claws; the bill is also black. Its habits have been observed principally in North America, where they were carefully studied by Audubon and Sir John Richardson. Both these authors state that it hunts during the day, and, Audubon adds, also in the dusk. It flies well, passing swiftly over its hunting ground, and capturing its prey by dashing suddenly down upon it. In pursuing birds on the wing, such as ducks, grouse, and pigeons, it strikes at them somewhat in the manner of the peregrine falcon. Its terrestrial prey consists of lemmings and hares; the latter it has been seen to pursue for some distance, grasping at the animal repeatedly with its foot; and it generally devours its victims on the spot, swallowing them whole if not too large. It is also said to be dexterous in fishing, often frequenting the borders of rivers for this purpose, and capturing its finny prey most cleverly by grasping with its foot as it sails along close to the surface of the water. In the Orkneys, and other places in the British islands where this bird has been met with, it appears to haunt the rabbit warrens and to feed on their inhabitants. In Sweden its habit of preying upon hares is said to have given origin to the name of *Harfang*, which it bears in that country. Dr. Edmonston describes it as feeding upon sandpipers, on which it pounces with great precision as it skims over the marshes; and from his account it would appear sometimes to swallow these birds whole. The same writer tells us that in the Shetlands "it affects solitary, stony, and elevated districts, which, by the similarity to it in colour of the rocks, renders it difficult to be discovered." On leaving its haunt, which it does only at the approach of twilight in the Shetlands, it is often pursued by crows and other birds, whose attacks it treats with the most contemptuous indifference. In captivity it appears to be gentle and tractable, and to exhibit a considerable degree of intelligence.

The accounts given by naturalists of the nesting of the Snowy Owl vary somewhat according to the nature of the country in which the birds have been observed. Thus, in Europe the birds have been found to breed on the ledges of steep rocks and on the old pine trees of the north; but in the fur countries of North America, Dr. Richardson describes them as making their nests on the ground. Their eggs are three or four in number, and of a white colour.

THE HAWK OWL (*Surnia Ulula*), which is nearly allied to the preceding, is also found in the high northern latitudes of both hemispheres, descending towards the south only during the winter. It is considerably smaller than the snowy owl, the male measuring only about fifteen inches in length, and the female seventeen. It is of different shades of dark brown and black, mottled and barred with dull white on the back and wings; the lower surface is dingy white with numerous transverse brown bars; the tail feathers are barred with brown and white, the beak is yellow, the claws horn-coloured, and the feet clothed with long whitish feathers to the very extremities of the toes.

The Hawk Owl is a bold and active bird, which, like the snowy owl, flies and pursues his prey by day-light. He feeds on partridges and grouse, and during the summer to a great extent on mice and insects; and so bold is this owl, that he will even descend upon a bird which has just been shot, and carry it off before the eyes of the sportsman. The snowy owl has also been known to perform the same feat. The nest of the Hawk Owl is built in a tree, and composed of sticks, grass, and feathers; the eggs are two in number, and of a white colour.

THE LITTLE RUFOUS OWL (*Athene Noctua*), the *Little Owl* of some English ornithologists, is a rare bird in this country, but common on most parts of the European continent. It measures scarcely ten inches in length, and is of a greyish-brown colour with a reddish tinge above, variegated with white spots of different sizes. The throat, breast, and belly are white, the two latter marked with longitudinal brown spots; the beak is yellowish-brown. The feathers with which the feet of this bird—and of the other species of its genus, which are numerous—are clothed, are very slender and bristle-like, presenting a great contrast to the thick plumage with which these parts are covered in most species of the family. The Rufous Owl lives in old houses and ruined towers, in the cavities of which it builds its nest. It is nocturnal, or at least crepuscular in its habits, and feeds upon mice, bats, and insects, and also upon small birds, which it captures while at roost. The female lays two eggs of a white colour.

THE LITTLE OWL (*Athene passerina*), the only other European species of this genus, is still smaller than the preceding, measuring only about seven inches in length. It has the upper parts of a brownish-ash colour, with white or reddish-white points and lines, and the lower parts of dazzling whiteness with numerous longitudinal brown spots. The feet are white with reddish spots, and the beak lead-colour, with the point yellowish. This bird does not appear to occur in Britain, but some confusion has arisen between this and the preceding species, in consequence of which the *Athene passerina* has been recorded as a British bird. It is found pretty commonly in Germany, and its habits seem to agree with those of the *A. Noctua*. Scopoli states that in Carniola this bird builds in chimneys; and two of the birds, to which the name of the *Little Owl* has been applied in this country, were taken in chimneys, so that it is just possible both species may occasionally pay us a visit.

THE LITTLE INDIAN OWL (*Athene Brama*), an abundant species in Southern India, closely resembles the *A. Noctua* both in size and plumage. It lives in families of four or five together, usually roosting during the day in large trees, but also about the eaves and roofs of houses, where it is often exceedingly noisy. It sallies forth from its retreat in search of food about sunset, when it generally takes short undulating flights from one resting-place to another, snapping up the insects which constitute its principal food as they also are taking their evening flight, or occasionally snatching one from its resting-place on the ground or the trunk of a tree. It also sometimes captures mice. Its flight is supposed, in some parts of the country, to prognosticate the course of future events; and Colonel Sykes says that amongst the Mahrattas, where this or a similar superstition prevails, "a class of persons, called from it, *Peengleh*, live on the credulity of the people by pretending to consult it, and predict events."

THE RADIATED OWL (*Athene radiata*), an inhabitant of India and China, is very common in thickly-wooded districts in those countries, inhabiting the largest trees, from which it sends forth its clamorous cries often throughout the whole day. It also flies actively in the daytime—at least when disturbed. Its food consists of insects, principally large beetles.

THE HAIRY OWL (*Athene scutulata*), which is also an inhabitant of India, and of the countries and islands to the east of that peninsula, is a small species of a reddish-brown colour above, and spotted with bright red beneath. It is further distinguished by having the toes fringed with stiff hairs, resembling the teeth of a comb. It is nocturnal in its habits, passing the day in the thickest jungles, and coming towards the edges and open parts at night. During its period of activity, its cries are incessant, and may be heard at a great distance. They are said strongly to resemble those of a cat undergoing the process of strangulation. Mr. Elliott says that, "when seized, it cries like a child." Its presence is regarded as ominous of misfortune by the natives; and when one of them is heard crying in the vicinity of a house, the inhabitants go out with lights to frighten it away.

THE BOOBOOK OWL (*Athene boobook*), which is exceedingly common all along the southern coast of Australia, is a small species about ten or eleven inches long, with the plumage of the upper surface and wings reddish-brown, spotted in some places with white, and that of the lower surface nearly white, reddish on the throat, and streaked with reddish-brown. It flies in pursuit of prey both by day and night; but its peculiar cry of *buck-buck*, from which its native name is derived, is only heard during the period of twilight and darkness. The note is said to bear some resemblance to that of the European cuckoo, and hence the colonists imagining that everything goes on by the rule of contraries at their end of the globe, determined that it was the cuckoo, which, in accordance with the law above-mentioned, uttered his notes at night instead of during the day. The food of this owl consists of small birds and large insects. It breeds in the holes of large old gum trees, laying its eggs upon the rotten wood occupying the bottom of the cavity.

THE SPOTTED OWL (*Athene maculata*), a still smaller species, measuring scarcely ten inches in length, seems to replace the preceding in Van Diemen's Land, where it inhabits the thickly-wooded gullies, and appears to seek its food principally at night, although able to endure the light of day. Its habits resemble those of the preceding species, and its food consists principally of small birds and insects. Its colour is brown, with numerous white spots on both the upper and lower surfaces.

THE POWERFUL OWL (*Athene strenua*), which appears to be peculiar to New South Wales, is a large and formidable species, measuring about eighteen inches in length. It has a strong and prominent bill; the whole upper surface is dark-brown, spotted and barred with paler brown; the throat is buff and the belly white, each feather bearing a transverse band of dark-brown near its tip. It is an inhabitant of the dense bushes, where it sleeps during the day, and which afford it a plentiful supply of birds and small mammalia during its nocturnal rambles. Its cry, which is hoarse and mournful, is compared by Mr. Gould to the "bleating" of an ox.

THE BURROWING OWL (*Athene cunicularia*), which is distributed over a great extent of country in America, from the prairies of the Mississippi to Chili and Coquimbo, is remarkable for some peculiarities in its habits. Wherever it occurs, it dwells, at all events during the breeding season, in burrows formed in the earth either by its own labour or by that of some digging mammal. At the bottom of its burrow the eggs are deposited on a bed of moss, grass, and dry roots; and here the young remain during the downy period of their existence, occasionally advancing to the entrance, but retreating immediately on the approach of any suspicious object. In the western prairies of the United States the Burrowing Owl is a constant inhabitant of the villages formed by the habitations of the marmot, or prairie-dog, as it is called, living on pretty good terms with the true owners. In fact the mode in which the marmots sport about near the entrances of their burrows, whilst the owls move briskly amongst them is said to furnish a most delightful and amusing spectacle. It is singular that the cry of this bird resembles that of the marmot, which consists of the syllables *cheh-cheh* pronounced several times in rapid succession, and that this note is also common to the individuals inhabiting the West Indies and other parts of America where no marmots occur. Hence, as Prince Charles Bonaparte remarks, we cannot suppose the marmot to be the unintentional tutor of the young owl. In the United States the food of the Burrowing Owls, according to the writer just quoted, consists exclusively of insects, and they seem never to touch the marmots among which they reside; but in the West Indies they are said to prey not only upon insects, but also upon rats, mice, and reptiles. The Burrowing Owl is a small species, only measuring between nine and ten inches in length. The plumage above is of a light amber-brown, with whitish spots; that of the lower surface is whitish with brown bands on the breast.

THE LITTLE AMERICAN OWL (*Nyctale acadica*) is a very small species, measuring only seven inches and a half in length. It inhabits the middle and northern states of the American Union and extends as far north as Nova Scotia and the Hudson's Bay territory. It occurs most abundantly towards the sea-shore, and amongst woods and pine swamps, in the shade of the sombre foliage of which it dozes through the day. The twilight is its period of activity, and its prey consists principally of mice, which it catches with great dexterity.

TENGMALM'S OWL (*Nyctale funerea*), another abundant North American species, a little larger than the preceding, is also found in the forests of Northern Europe, and more sparingly in the more southern parts of the Continent. It has also been met with in Egypt. In this country it is rarely seen. In America it occurs most abundantly in the Hudson's Bay territories, where, according to Sir John Richardson, it occupies all the wooded country from the Great Slave Lake to the United States, but is most plentiful on the banks of the Saskatchewan. It is nocturnal in its habits, and cannot bear the light of day. Its cry is a single melancholy note, repeated at intervals of a minute or two, and the Indians have a superstitious practice of whistling when they hear it. They suppose that if the bird does not reply it is a sign of the speedy death of the whistler, and hence the Cree Indians call it the *Death-bird*. Like the preceding species, it builds a nest about halfway up a pine-tree, and lays two white eggs.

THE SCOPS EARED-OWL (*Ephialtes Scops*), the *Little Horned Owl* of some writers, is one of the smallest species of the family, measuring little more than seven inches in length. Like many other owls, its head is adorned with two tufts of feathers, which in this species resemble small pointed ears, projecting upwards and backwards from behind the eyes. Its beak is short, and the feet feathered only to the base of the toes, which are naked both above and below. The colour of the plumage of the back consists of two shades of brown, mottled with grey, and barred with dark lines; the tail feathers are barred and spotted with brown and black; the lower surface is greyish, mottled and streaked with different shades of brown.

The regions inhabited by this little owl lie further to the south than those which constitute the favourite residence of the preceding species. It is found abundantly in the southern countries of Europe, especially in Italy and France, but appears to migrate even thence into the warmer regions of Africa for the winter season. In France it is said to appear and depart with the swallows. It occurs in India, and breeds in the Himalayas at an elevation of five thousand feet. It is a rare visitor to Britain, but several specimens have been taken in different parts of England. Its habits are nocturnal, and, according to the late Mr. Spence, its melancholy cry of *kew*, *kew*, may be heard in Italy at intervals of about two seconds almost all night long. Its food consists of mice, beetles, moths, and other insects. When reposing on the branch of a tree during the day, it does not, according to Dr. Gerbes, a French ornithologist, sit transversely on its resting-place, as is usual with birds, but almost always takes up a position parallel to it. The nest of the Scops Eared-owl is formed in the holes of trees and old walls; it lays from three to four white eggs. It may be tamed with great facility, and is an interesting little bird in confinement.

THE RED EARED-OWL (*Ephialtes Asio*) is a North-American species, and appears to be tolerably common in the United States, especially towards the north. It migrates southwards in the winter. It frequents the high grounds, and feeds on mice, small birds, beetles, and other insects. During the day this bird roosts in the thick evergreen trees, and comes abroad in the evening, when it may be heard uttering a peculiar cry, described by Wilson as a "melancholy quivering kind of wailing," from which it has acquired the name of the *Little Screech-owl*. Its nest is made with a little hay and a few feathers in the hole of a tree; in this the female usually deposits four white eggs.

THE EAGLE OWL (*Bubo maximus*), one of the largest species of this family, is an inhabitant of Europe, where it is tolerably common in the great forests of the Continent, but is only a rare and occasional visitor to the British islands. It is also found in many parts of Asia, even as far to the east as China. When full-grown this bird measures from twenty-four to twenty-eight inches in length, the females being the largest. The colour of the plumage on the head, neck, and back, is reddish-brown, streaked and mottled with dark brown; the quill feathers of the tail and wings are barred transversely with dark brown; the feathers of the facial discs are light brown, speckled with black, and below the face are some white feathers, forming a more or less distinct irregular white band; the lower surface is pale brown, spotted and barred with dark brown. The head is ornamented with two large tufts of feathers which stand up above the eyes like horns; and the feet are feathered down to the extremities of the toes.

Although this magnificent owl is so common in some parts of Europe, its habits appear to have been but little studied. Its activity is principally nocturnal, although it appears able to support the light better than some of its allies. Its prey consists of hares, grouse, and partridges, which fall easy victims to a bird of its strength and size. Some writers state that its courage is equal to its powers, and that it has no fear of a dog; when hard pressed it is said to throw itself on its back and defend itself vigorously with its claws. It has even been described as contending successfully with the eagle, and a French writer tells us that he witnessed an engagement of this kind, in which the owl fixed himself so firmly to his adversary with his talons, that both came to the ground together, and were taken alive.

The nest of the Eagle Owl is a bulky structure, usually placed upon the ledge of a rock, or the walls of old ruins, but sometimes on the ground. The eggs are two or three in number, and pure white. The parents appear to attend to their young with great devotion, at least if we may judge from the following anecdote related by the late Bishop of Norwich, in his "Familiar History of Birds." This instance of parental solicitude "was witnessed by a Swedish gentleman, who resided several years on a farm near a steep mountain, on the summit of which two Eagle Owls had built their nest. One day in the month of July, a young bird, having quitted the nest, was caught by the servants. This bird was, considering the season of the year, well feathered; but the down appeared here and there between those feathers which had not yet attained their full growth. After it was caught it was shut up in a large hencoop, when, to his surprise, on the following morning a fine young partridge was found lying dead before the door of the coop. It was immediately concluded that this provision had been brought there by the old owls, which no doubt had been making search in the night-time for their lost young one—and such was, indeed, the fact; for night after night, for fourteen days, was the same mark of attention repeated. The game which the old ones carried to it consisted chiefly of young partridges, for the most part newly killed, but sometimes a little spoiled. On one occasion a moorfowl was brought, so fresh that it was actually warm under the wings; and at another time a putrid stinking lamb was deposited."

This bird is frequently seen in confinement, when it hisses like a cat, and snaps its bill at any object which annoys it, but rarely emits any regular cry. Sir William Jardine mentions that a specimen kept by him used to "bark" incessantly at night, making a noise so exactly like the bark of some little cur, as to irritate his large housedog, whose angry replies disturbed the whole neighbourhood.

THE VIRGINIAN HORNED OWL (*Bubo virginianus*), which was formerly supposed to be identical with the European species, is a common inhabitant of the United States of America, from which it appears to extend its range to a considerable distance both north and south. Its favourite residence is amongst the gigantic trees of the swamps, where in the morning and evening it startles the echoes by loud and sudden cries of *Waugh O! Waugh O!* sufficient, as Wilson says, to alarm a whole garrison. The same writer gives the following striking account of the varied vocal powers of this bird:—"He has other nocturnal solos, no less melodious, one of which very strikingly resembles the half-suppressed screams of a person suffocating, or throttled, and cannot fail of being exceedingly entertaining to a benighted traveller, in the midst of an Indian wilderness!" The American Indians, like many of their more civilized brethren, on this side of the Atlantic, entertain a strong superstitious feeling with regard to owls; and this Great American Horned Owl, which appears to possess the properties necessary for inspiring superstitious dread in a pre-eminent degree, is made use of by the priests of some tribes of Indians as a fitting symbol of the supposed mysteries of their office.

The Virginian Horned Owl is nocturnal in its habits, sleeping during the day either in the hollow of a tree, or under the shadow of the dense masses of foliage of the cypress swamps. Its food consists of rabbits, squirrels, rats, mice, partridges, and other small birds and quadrupeds; and it occasionally steals chickens from their roosting places in the farm-yard. The nest, which is of considerable size, and composed of a great mass of sticks, lined with a few dry leaves and feathers, is built on the forked branch of a tall tree, and in it the female deposits four eggs, which are nearly round and of a pure white colour.

THE GOOGOO HORNED-OWL (*Bubo bengalensis*), the most abundant and widely distributed of the large owls of India, usually frequents rocky hills, ravines, and old buildings, not unfrequently sheltering itself for its diurnal slumbers in the numerous holes which occur in such places. On the Neilgherries, however, it inhabits the wooded glens. In its general habits it is nocturnal, but not so strictly so as some of the preceding species; it flies readily when disturbed during the day, and commences its quest for food long before dark. The Googoo preys principally upon rats and lizards, but often diversifies its diet with small birds, crabs, and large insects. Its usual cry is a single long, clear, and loud hoot, but it sometimes indulges in one of those imitations of the noise made by an animal undergoing the operation of strangling, which appear to be such a favourite mode of exercising their vocal powers with many owls. The nest is always made in a hole or burrow in a bank or rock, and the young are said to be invariably two in number.

THE ORIENTAL HORNED-OWL (*Bubo orientalis*). This, which is also an Indian species of great size and strength, inhabits the recesses of dense and lofty woods and forests, where the deep shade of the foliage makes a sort of twilight even at noon-day, and thus enables this bird to seek its prey at a time when most of its relatives are taking their repose. Its chief activity is, however, at night, when it issues forth into the open country. The food of this owl consists principally of pheasants, hares, rats, and snakes; but it sometimes preys upon the fawns of the small Indian deer, and Mr Jerdon was informed by an intelligent native that fish also form a part of its diet, and that it will dive to some depth for them.

THE YELLOW-FOOTED OWL (*Ketupa flavipes*). Besides the preceding, several species of Horned-Owls inhabit the East Indies and the adjacent islands, and of these three have been formed into a peculiar genus, which has been named *Ketupa*, from the Javanese name of the species first described. The most striking distinctive character of these birds consists in their having the whole of the feet bare of feathers, and covered with a granular or irregularly scaly skin.

The Yellow-Footed Owl is a tolerably common species in many parts of India, especially towards the north, and also abounds in the Indian Islands and in Siam. It is a large, heavy, clumsy, but powerful bird, which flies well by day, and is usually found in the vicinity of rivers, where it preys upon fish and crabs. Amongst the Siamese, according to Mr. Finlayson, "the skull of this bird is held in considerable estimation as a medicine in small-pox, and chiefly to check and alleviate the itching sensation which takes place in the curative stage. For this purpose the head is rubbed upon a stone with water, which, thus impregnated, is received into a vessel, from which an attendant spurts a quantity of it on the body from time to time."

THE CEYLONESE EARED-OWL (*Ketupa ceylonensis*), a second species of the genus above referred to, is found not only in Ceylon, but also in most parts of India. It is a large and powerful bird, which resembles the preceding species in its habits, and, like it, sometimes flies by day. Its principal activity is during the twilight, and at that time it emits its hoarse cry, which is described as resembling a harsh repulsive laugh, expressed by the syllables *haw, haw, haw, ho!* The third species (*K. javanensis*) appears to be peculiar to Java.

THE LONG-EARED OWL (*Otus vulgaris*)—Plate 4, fig 10—which is not an uncommon species in Britain, occurs also in most parts of the northern hemisphere. It inhabits the continent of Europe generally, and in France is the most common of all the owls. Eastward it extends its range as far as India, and towards the south it is found in the northern parts of Africa. It is also an abundant bird in the United States of America and in Canada, reaching as far north as the Hudson's Bay territory, but apparently only advancing to such high latitudes during the summer. In other places it does not appear to be migratory.

Wherever it occurs the Long-eared Owl always takes up its abode in wooded districts, usually preferring thick plantations of evergreen trees, or adopting the thick covering of ivy which often covers old trees in large woods, for its diurnal hiding-place. Unlike the generality of the owls, which are rather noisy birds, the Long-eared Owl rarely lets his voice be heard, at least after he has arrived at the age of discretion; the young birds, however, are rather clamorous, emitting a loud and rather shrill, but somewhat plaintive cry, even after they have quitted the nest. This species is strictly nocturnal, rarely moving in the daytime except when disturbed in its retreat, but at night it is active in search of its prey, which consists of rats, mice, moles, and similar small four-footed game, together with insects and small birds. The latter it is said to capture by snatching them from their roosting-places, and, indeed, it is difficult to imagine how it could obtain them in any other way. However this may be, the finches, warblers, and other small birds seem to regard the owl in the light of an enemy, and show the greatest animosity towards him whenever they have an opportunity for such a display of their feelings. If he should by chance prolong his predatory excursions, so as to be surprised by the garish light of day when still at a distance from his favourite haunts, and thus be compelled to take refuge in some such imperfect shelter as a hedge or bush affords—the discovery, almost certain to take place, of the unfortunate sleeper in his temporary lodging, is the signal for a simultaneous rising amongst all the small birds in the neighbourhood, who flock to the place and raise such a commotion as rarely fails to cause the owl to change his quarters; and should he be at such a distance from the thick woods and plantations as to render his reaching them very difficult, or even impossible, while his senses are dimmed by the unwonted glare, the disturbance will sometimes last until the shades of evening put a stop to it, by dismissing the little persecutors to their roosting-places, and placing the owl in a position to avenge himself for their insults if they still ventured to continue their annoyance.

The Long-eared Owl builds early in the season; the young being frequently hatched in April. It rarely builds a nest for itself, being content to lay either in the hole of a tree, or more commonly in the deserted nest of some other bird of suitable size—such as the rook, the crow, or the woodpigeon—which it usually repairs roughly by the addition of a stick or two. The eggs are four in number, and, like those of the owls in general, pure white.

THE SHORT-EARED OWL (*Otus brachyotus*), like the long-eared owl, is met with pretty abundantly in the northern parts of both hemispheres, inhabiting the higher latitudes during the summer, and migrating southwards as the cold weather approaches. In this country the Short-eared Owl is a permanent resident, that is to say, many individuals remain with us throughout the year, and build in some parts of the kingdom; but their numbers receive a great increase in the autumn by an immigration from the northern parts of Europe, especially the Scandinavian peninsula. This immigration occurs at the same period with that of the woodcocks, and hence this bird is sometimes called the *Woodcock Owl.* In the spring there is a migration in the opposite direction, many individuals returning to their northern home, to pass the summer and breed.

This species measures from fourteen to fifteen inches in length. It has a small head, adorned with a pair of little tufts, which, like those of the other Eared-owls, can be elevated or depressed at pleasure. The facial discs are complete, and composed of light-brown feathers, which are nearly black at their base, forming a dark ring round each eye; the plumage of the head, neck, back, and wings is dark brown, with the edges of the feathers fawn-colour; the primaries of the wings and the tail feathers are pale, barred with dark brown; and the lower surface of the body is pale buff, with patches and streaks of dark brown.

Unlike the long-eared owl, this species does not shelter itself in the woods and plantations, but frequents the open country, and rests upon the ground in fields, and on commons, heaths, and moors. Here it lies close amongst the herbage and stubble of the turnip and corn fields, and the heath and other plants of its wilder haunts; in the former situations it is frequently flushed by sportsmen, when partridge-shooting late in the autumn. In the winter, when the frost has cut off much of the vegetation on the open grounds, this owl takes shelter at the bottom of the hedge-rows. Its ordinary food consists of small quadrupeds and birds, which it captures at night; although, when disturbed during the day-time, it does not seem to be so much inconvenienced by the glare as some of its allies. In the Orkneys, indeed, according to Mr. Low, it even pursues its prey during the day. That writer says, "It is impudent in breeding-time, sometimes catching up chickens from the doors—I have likewise seen it in chase of pigeons in daylight, which is not ordinary with the owl kind." He adds that, in a nest which he found in Hoy, there "were the remains of a moorfowl, two plovers, besides the feet of several others, and the birds, two in number, ready to fly." The nest is made upon the ground amongst the heath and other plants; it is a rude habitation, often consisting only of a hole scraped in the ground, upon which the eggs are laid, without even the slightest attempt at a lining. The eggs are usually two or three in number.

THE BROWN OWL (*Syrnium aluco*)—Plate 3, fig 9—often called the *Tawny Owl*, which is not an uncommon bird in wooded districts in England, is nearly allied to the preceding species, but differs from them in the total absence of the ear-like tufts upon the head. It measures about fifteen or sixteen inches in length. This owl appears to become rarer towards the north, so that in the Orkneys it is only met with in the summer, and it is less abundant in Scotland generally than in England; it is common in most parts of the continent of Europe, and also occurs in Asia and the north of Africa.

In its habits the Brown Owl is strictly nocturnal; the glare of day dazzles and bewilders it so much as to render it perfectly helpless, and it shows the wisdom which might be expected from the favourite of Minerva, by retreating during the day to the cover of some thick wood, where it reposes amongst the dense foliage. But as the sun sinks below the western horizon, and the shades of evening gradually steal over the open country, the Brown Owl prepares to quit its place of concealment, in order to satisfy an appetite which, as it is somewhat indiscriminate, is perhaps appeased with but little difficulty. Flitting along with noiseless wings the owl finds it easy to surprise the smaller quadrupeds, such as rats, mice, and moles; but he is not content with these, and boldly seizes on young rabbits and leverets when they come in his way. Small birds, also, constitute a portion of his diet, and to this varied supper he often adds frogs, insects, and even fish. Of the latter, he has been known to capture both those species which often swim near the surface of deep water, and those which, like the bullhead and the loach, dwell amongst the stones, at the bottom of shallow brooks. Mr. M'Gillivray mentions that he found the stomach of one of these birds nearly filled with earthworms, torn into fragments of about half-an-inch in length. With so many resources, the Brown Owl can hardly ever want a good supper. While engaged in its predatory excursions, it emits a loud and doleful hooting cry, resembling the syllables *hoo-hoo-hoo*, and occasionally gives utterance to a shrill scream.

The Brown Owl does not appear to build a nest of its own, but deposits its eggs, and hatches and brings up its young, either in the hole of a tree, or in the deserted nest of some other bird. The eggs are three or four in number, and pure white; they are hatched in April.

THE BARRED OWL (*Syrnium nebulosum*), one of the commonest owls in the United States of America, is considerably larger than the preceding; for although the male is only sixteen or seventeen inches in length, the female often measures twenty-two inches, or even two feet. It is of a reddish-brown colour above, streaked and spotted with white; the neck and breast are whitish, with transverse brown bars, and the belly is yellowish, streaked longitudinally with brown.

The Barred Owl is an inhabitant of the woods and forests of North America, where its loud discordant cry, which is compared by Audubon to the syllables *whah-whah-whah-whah-aa*, is constantly to be heard as the shades of evening descend upon the earth. According to the author just mentioned, the effect of this cry is very strange and ludicrous, so that he says it would not be surprising if the hearer were to compare it "to the affected bursts of laughter which he may have heard from some of the fashionable members of our own species." Proceeding in this cynical strain, Audubon gives us to understand that the gestures of the bird are as ludicrous as his voice, and says, "The liveliness of his motions, joined to their oddness, have often made me think that his society would be at least as agreeable as that of many of the buffoons we meet with in the world." It is not, however, at night only that this owl is active; it flies freely by day, and, when the weather is lowering, its cry is heard all day long. When approached by any intruder on its solitudes, its gestures are very curious. It lowers its head, puffs out the surrounding feathers so as to form a sort of ruff, fixes its eyes in a broad stare upon the intruder, and, whilst watching his movements, moves its head to and fro in so extraordinary a manner as almost to lead one to the belief that that part is dislocated from its body. If the object of its suspicions approach it too closely, it flies off to a short distance, and alights with its back to the person, but immediately turns round with a single jump to recommence its scrutiny. If it be shot at and missed, it flies off to a considerable distance, and, on alighting in a safe place, utters its cry in a pompous tone, which seems to indicate some degree of triumph over the unsuccessful marksman.

The food of the Barred Owl consists of young rabbits, leverets, mice, and small birds; it is also a great destroyer of chickens, and is said by Audubon to be "especially fond of a kind of frog of a brown colour, very common in the woods of Louisiana." On the other hand the owl itself is made use of as food by man; and it "is very often exposed for sale in the markets of New Orleans. The creoles make *gumbo* of it, and pronounce the flesh palatable." The eggs are laid either in the holes of trees upon the dust and rotten wood with which they are covered at the bottom, or in the deserted nest of a crow or hawk; they vary in number from four to six, and are of almost the same size as a hen's egg, but nearly globular in form.

THE BARN OWL (*Strix flammea*)—Plate 4, fig. 11—which is also frequently called the *White Owl* and the *Screech Owl*, is the commonest species of the whole of this family in the British isles, and is likewise very generally distributed in all parts of the eastern hemisphere. The Barn Owl of the United States, which is very similar to the British bird, was formerly regarded as identical with it, but it is now generally admitted to constitute a distinct species.

The Barn Owl measures from fourteen to fifteen inches in length, the females being usually about an inch longer than the males. Like the preceding species, it has the facial discs complete, that is to say, they entirely surround the eyes; and the two discs meet in the middle of the face in such a manner as to form a straight ridge, running upwards from the beak. The whole upper surface of the bird is of a light reddish-yellow colour, minutely mottled with ashy grey, and marked with combined small black and white spots; the facial discs and the whole of the lower parts are white, the latter sometimes marked with a few dusky spots. The tail feathers are of the same colour as the upper surface, but marked with five transverse grey bars; the beak is nearly white, and the claws brown.

Unlike most of the owls to which we have previously referred, the Barn Owl does not take up his residence in the wilder parts of the country, but approaches boldly to the dwelling-places of man, and seeks his food in the midst of towns and villages, and in the cultivated fields surrounding them. His chosen retreat is some dark hole or corner of an old building, the tower of a church, or the roof of a barn; sometimes, however, he takes up his quarters in a hollow tree. Strictly nocturnal in his habits, he passes the whole day in his retreat, dozing away the bright hours, whose glare would be insupportable to his eyes; and if by any chance he is driven from his concealment at this time, he is so dazzled by the unwonted light as to become quite bewildered and helpless. To add to this misfortune when it happens, all the small birds within reach make a point of attacking him whenever he appears abroad during the period of their activity, and the unfortunate owl gets no rest until he reaches some friendly shelter. Even when he has resorted to a wood, in order to enjoy his day's rest under the shadow of the thick foliage, he does not always escape the malevolence of his little tormentors; should a small bird discover him, the alarm is immediately given, and in a very short time the owl is surrounded by a troop of vociferous enemies. But when the sun goes down in the west, and the twilight begins to envelope the face of nature with its dusky mantle, the owl assumes a very different character; from being the sport of the weakest inhabitants of the grove, he becomes a tyrant, and, gliding forth on noiseless pinions, goes to seek his prey. He may then be seen dashing round the stacks and buildings in the farm-yard, perching now and then upon a cart or waggon, or skimming rapidly over the fields and along the hedgerows, carrying destruction to all the weaker creatures which venture forth at night. The moment he perceives his prey upon the ground, he drops suddenly down, seizes it in his claws, and uttering a shrill cry, or *screech*, flies off with it to his nest. In this way rats and mice of all kinds, and other small mammalia, including even very young hares and rabbits, are captured by this nocturnal marauder, who also destroys larks and other small birds which may be met with on the ground. He often catches the moths and beetles which fly so abundantly during the summer evenings, and, according to Mr. Waterton, will also capture fish, by diving boldly into the water. But the principal food of the Barn Owl undoubtedly consists of the mice of different species, which abound to such an extent about the stack-yards and corn-fields, and these, when captured for the owl's personal benefit, are generally swallowed whole, sometimes without even their bones being broken. These, and other indigestible parts of all its prey, are afterwards collected into pellets in the stomach, and finally disgorged in its resting-place, where these pellets often accumulate to an astonishing amount. Mice also constitute the great bulk of the food brought by these owls to their young ones; and it is upon this fact that Mr. Waterton relies in his plea for considering this bird as a benefactor to the farmer. While the young are in the nest, which is the case throughout the greater part of the year, as several broods are produced in the season, the owls will bring a mouse to the nest every twelve or fifteen minutes; and in the course of sixteen months, Mr. Waterton's owls accumulated in their dwelling-place a deposit of more than a bushel of pellets, each of which seems to represent on an average about five mice. In the face of such facts as these, the Barn Owl should certainly be pardoned for any depredations that he may commit amongst the young of our game-birds, as these must be infinitely more than counterbalanced by the benefit he confers on the husbandman by the destruction of vermin.

The nest of this bird is placed in its ordinary dwelling, and consists simply of a few sticks and straws, upon which the eggs are deposited. The eggs are said to vary from two to five in number; and it appears, from a notice published many years ago by Mr. Blyth, that a fresh laying takes place before the first brood is able to quit the nest. He says that a nest was found in the neighbourhood of Tooting, which "contained two eggs, and when they were hatched, two more were laid, which latter were probably hatched by the warmth of the young birds; a third laying took place after the latter were hatched, and the nest at last contained six young owls of different ages, which were all reared."

The screeching cry of the Barn Owl, which is often heard about ruined buildings and church-yards, can hardly break suddenly on the ear during the silence of the night without producing some effect upon the imagination, and this sound has been regarded in almost all ages and countries with a certain degree of superstitious dread. This equivocal honour is shared by the Barn Owl with many other species; but, according to Pennant, the Barn Owl has the advantage over his brethren, in that the Mongols of Tartary "almost pay it divine honours, because they attribute to its species the preservation of the founder of their empire, Genghis Khan. That prince, with his small army, happened to be surprised and put to flight by his enemies, and forced to conceal himself in a little coppice; an owl settled on the bush under which he was hid, and induced his pursuers not to search there, as they thought it impossible that any man could be concealed in a place where that bird would perch."

THE AMERICAN BARN OWL (*Strix perlata*), which closely resembles the preceding, and was regarded by Wilson and other writers as identical with our British species, is by no means common in the United States, but occurs more abundantly in the West Indies and South America. Its habits appear to resemble those of its European relative; its favourite food consists of field-mice, of which it devours great quantities.

THE JAVENESE OWL (*Strix javanica*), which has been found both in Java and on the continent of India, has similar habits to our Barn Owl, and, like it, inhabits the vicinity of villages and farms. It is not, however, regarded with much favour by the natives on this account, as they entertain various superstitious notions regarding it, and in some places its appearance is considered of evil omen. Colonel Sykes, who met with this species in India, says that one of his specimens "was captured alive, while lying on its back on the ground, defending itself against the attacks of a body of crows."

THE AUSTRALIAN BARN OWL (*Strix delicatulus*). Although this bird is a native of Australia, where it is very abundant and generally distributed, it very nearly resembles our European species in size, form, and colouring; in habits, also, the two birds are precisely similar. Several other nearly allied species are also met with in Australia; and one, the *S. castanops*, which is of considerably larger size, appears to be peculiar to Van Diemen's Land.

THE BAY OWL (*Pholidus badius*), WOWO-WIWI, or, KALONG-WIWI of Java, is the last species of this family, and of the order Accipitres to which we shall allude. It is a rare bird in Java, residing in the darkest forests; and it is principally remarkable from the belief entertained by the Javanese that it lives in a state of the closest familiarity with the tiger, venturing even to alight on the back of that formidable quadruped, which, like itself, inhabits the recesses of the forest.

ORDER II.—PASSERES.

THE order of the Passeres or passerine birds, which may be regarded as including the types of the whole class, is of very great extent; and the birds composing it exhibit a vast variety both of structure and habits. Amongst the Passeres we find species almost as predaceous as many of the preceding order; others whose food consists entirely of insects; others, again, which manifest a predilection for carrion nearly as strong as that of the Vultures; and others which content themselves with vegetable food. Even amongst the last there is, as may easily be supposed, a great variety; some feeding solely upon soft fruits, whilst others derive their nourishment from the hardest seeds and nuts. As might be expected, this want of uniformity in one of the most important conditions of life, causes a corresponding variety in the structure of those parts which are in any way concerned in the business of eating, and this even in a greater degree than could be foreseen from the mere differences in the nature of the food; for many birds of this order, which agree generally in the nature of their nutriment, differ from each other in their mode of obtaining it, and thus the modifications of the bill become almost endless. The mode of life of the birds also varies greatly, and by this means further modifications are introduced into the general organization; so that it becomes a matter of considerable difficulty to indicate the general characters by which the present order is circumscribed. This difficulty is certainly not lessened by the fact that some members of the following order appear to differ only in a single character of somewhat uncertain value from the passerine birds; in fact, although we have left the forms just alluded to amongst the Scansores, in order to present the reader with a view of the classification generally adopted, it has long been our opinion that this portion of the system requires to be remodelled. But we shall return to this subject hereafter.

To speak in general terms, the birds belonging to the present order may be denominated *Perchers par excellence;* that is to say, they of all birds are best adapted for a life amongst the branches of trees, as they exhibit the greatest facility in perching and hopping from one branch or twig to another. Hence Cuvier, and after him many other authors, denominated these birds *Insessores* or Perchers. For this purpose their feet are well adapted. The tarsi are of moderate length, and the feet consist of four well-developed toes, placed, as in the preceding order, three in front and one behind, furnished with claws of moderate length, and endowed with a sufficient grasping power to secure the bird firmly upon its perch; whilst at the same time the general structure of the foot and leg is not so decidedly prehensile as to prevent its readily quitting its hold. In the predaceous birds, on the contrary, the long grasping toes are arranged specially to enable their possessor to secure and carry off its prey; and for the same purpose they are terminated by large and powerful claws. The whole organization of the hinder limb is also directed to the same object, and thus the predaceous birds, although they perch, are by no means at home amongst the branches, and exhibit but little grace or agility in their movements upon them.

Although this arrangement of the toes, three before and one behind, constitutes one of the principal characters of the order Passeres, it must be confessed that it is liable to certain exceptions, which render it especially difficult to draw the line between this and the following order. The latter is distinguished, as indicated in the table of orders—(p. 235)—by having the toes placed two in front and two behind. Now several passerine birds have the power of reversing one of the toes, so as to reproduce, temporarily, the scansorial foot; whilst, on the other hand, some of the scansores, such as the cuckoos, are able to turn one of the hind toes forwards. In the swifts, also, which belong to the present order, *all* the toes are turned forward.

The other general characters of the feet, taken in conjunction with the arrangement of the toes, will generally enable us to determine whether or not a bird belongs to this order. The tarsi which, as already stated, are of moderate length, are scutellated or covered with shield-like horny plates; of these there are generally several on the anterior surface, whilst the hinder surface is usually occupied by a single long shield. The whole upper surface of the toes is protected by series of similar but smaller and more numerous plates; and in most cases the only part of the foot which exhibits a granular or reticulated appearance, is the lower surface of the toes. The toes are not furnished at the base with a distinct membrane or small web, such as is usually found at this point in other birds; but, on the other hand, the outer toe of each foot is generally united to the middle one for a greater or less extent; sometimes only at the base, but sometimes nearly to the extremity. The claws with which the toes are armed are either of moderate length and strength, or very long and slender; they never emulate the formidable talons of the predaceous birds, nor do they degenerate into the flat scratching nails characteristic of the gallinaceous birds.

This structure of the hind limbs renders the Passeres very active on their feet, whether they disport themselves amongst the branches and twigs of the trees, or hop, as is their usual manner of progression, on the ground. Their wings or anterior members are also well developed, and they generally possess the power of flight in a very high degree of perfection. In this respect, indeed, we find a considerable variety amongst the members of this group, some of them furnishing most remarkable examples of rapid and long-continued flight; others enjoying the power of moving through the air with more moderation, but few deserving the character of being feeble flutterers. In accordance with these variations in the volitant power, the form of the wings also varies, being long and pointed in those which fly best, and broader and rounded at the tip in proportion as the power of flight diminishes; but the number of primary quill feathers in the wings is tolerably uniform, being generally ten, although the first of these is frequently very small, or even altogether wanting. The quill feathers of the tail are generally twelve in number.

The form of the bill, as may be supposed from the statement already made with regard to the great difference of food, is very variable; but it is to be remarked that it never partakes of the strongly-hooked character which prevails in the preceding order, nor is its base covered by anything like a cere. The bill is ordinarily conical; sometimes short and stout; sometimes elongated and slender; in many of the long-billed forms, the whole of the organ is more or less curved; and a considerable number of those with short bills have the upper mandible slightly arched, and bent down at the tip, near which the margins are armed with small teeth. The object of these various forms of the bill, and of others to which we need not refer here, will be readily seen when we come to treat of the history of the species belonging to this order, in the classification of which they are also of great importance.

With regard to the internal structure of these birds, we need only state that the œsophagus is dilated into a small crop; that the walls of the stomach are very thick and muscular, forming a gizzard; and that in many of them the inferior larynx, situated at the point of union of the two bronchial tubes coming from the two separate lungs, is provided with a complicated apparatus of small muscles, by the action of which the birds are enabled to modulate their notes in a surprising manner, so as to produce that delightful music which charms the ears of all wanderers in the country throughout the spring and summer.

From the vast variety of forms included in this order, and the gradual manner in which their distinctive characters blend one with the other, the division of these birds into subordinate groups presents no small difficulties; and the opinions of authors upon their classification are almost as various as the authors themselves. It is impossible for us to travel through these minutiæ of classification, the discussion of which, moreover, would be neither interesting nor instructive to the reader; the system here followed is nearly identical with that of Mr. G. R. Gray, which in its turn is founded upon that of Cuvier. The latter great naturalist divided his order of passerine birds into five great families, to which he gave the names of *Dentirostres*, *Fissirostres*, *Conirostres*, *Tenuirostres*, and *Syndactyli;* the first four being characterized by peculiarities in the conformation of the bill, and the last by the structure of the feet, the outer toe in each foot being united to the middle one throughout nearly the whole of its length. Of the birds thus distinguished, the majority are now generally admitted to be nearly allied to those forming Cuvier's group of the *Fissirostres*, with which they may well be associated in a single tribe or suborder; the remainder (the Hornbills) approach the Crows in their general structure, and may be placed with them in the tribe of *Conirostres*. This leaves four divisions which may be briefly characterized as follows:—

1. FISSIROSTRES, with the bill usually more or less depressed at the base, and the gape wide, opening as far back as the eyes—see Plates 5 to 7.

2. TENUIROSTRES, with the bill much elongated and slender, and the gape not so wide as in the preceding group—see Plates 8 and 9.

3. DENTIROSTRES, with the upper mandible more or less curved, hooked at the tip, and armed with a single tooth on each side—see Plates 10 and 11.

4. CONIROSTRES, with a stout and usually straight conical bill, in which the upper mandible is either smooth at the edges or toothed throughout—see Plates 12 and 13.

It is to be observed, however, that the characters above given are only to be regarded as appertaining to the groups *generally;* as from the gradual passage of the one into the other, it sometimes becomes necessary, in order to avoid violating evident affinities, to place a given bird rather arbitrarily in the group to which it belongs by its general characters, although it may not distinctly present those expressed in the name of the group.

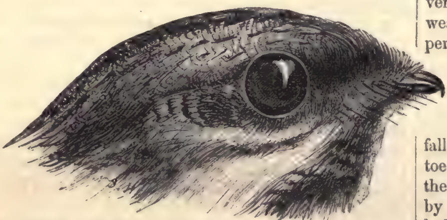
TRIBE I.—FISSIROSTRES.

THE tribe of the Fissirostral birds, with which we commence the long series of Passeres, is distinguished, as already stated, by the great extent of the gape, which, in the most typical or characteristic forms, reaches as far back as the hinder margin of the eye. The birds thus characterized constituted the whole of the group as established by Cuvier; but most modern ornithologists are agreed in referring to the same position in the system several families which, in the classification of Cuvier, occupied a very different place. Nevertheless, the distinction between these birds is so well marked, that we may regard this tribe as consisting of a typical and an aberrant group of families, rather than of a nocturnal and a diurnal one, as is usually done; for the nocturnal forms—the Goatsuckers—are very nearly allied to the Swifts and Swallows, and form with them a perfectly natural group; whilst the remaining families are almost equally closely related to each other in their general conformation. The typical families correspond with the order *Chelidones* of Vieillot and Temminck.

FAMILY I.—CAPRIMULGIDÆ.

The Caprimulgidæ, or Goatsuckers, are distinguished by the intensity with which they exhibit the fissirostral characters: the bill is very short and much depressed, and the gape uncommonly wide, extending quite beneath the eyes. The upper margins of the gape are generally bordered by very long stiff bristles, which in some species betray their analogy with feathers by bearing a few barbs upon their sides. The legs and tarsi of these birds are rather short, but the anterior toes are long and stout; and the hinder toe, which is shorter, is turned somewhat forward, and slightly united at the base to the inner anterior toe. The wings are usually long, and rather pointed, but far inferior in both these respects to those of the other families of typical Fissirostres, which scarcely yield to any other birds in length and power of wing. A further distinction of the Goatsuckers consists in their adaptation to a nocturnal mode of life, in which they resemble the Owls, with which we concluded the preceding order. Like all nocturnal birds, they have a soft plumage, which enables them to fly noiselessly through the air; and large eyes, adapted for the perception of objects in the dim twilight. They are insectivorous birds, feeding principally upon the moths and beetles which fly at night. These they capture on the wing, and the long spreading bristles with which the mouth is fringed are of the greatest service to them in capturing this active kind of prey.

Fig. 103.

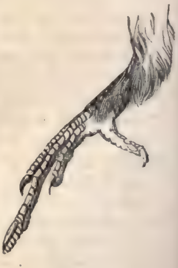


Head of Goatsucker (Caprimulgus europæus).

THE COMMON GOATSUCKER (*Caprimulgus europæus*), —Plate 6, fig. 17, and woodcuts 103 and 104—may be first referred to, as it is almost the sole representative of the family in Europe, and is not an uncommon bird in this country. It is, however, a bird of passage, retiring to the warm regions of the South, from the colder and temperate countries of Europe and Northern Asia, in the autumn, before the inclemency of winter has destroyed its insect food; and returning again to its summer quarters in the month of May, when the mild weather of spring has begun to vivify the insect world.

The Common Goatsucker measures about ten or eleven inches in length, including the tail, which is rather long. The plumage is dusky in its general tint, presenting when closely examined a mixture of grey, red, and brown; but the whole of the upper parts are streaked and spotted with blackish-brown, and the tints of the lower surface are arranged so as to form a series of alternately dark and light undulated bars. The eyes are dark, and very beautiful. In common with numerous allied species of the family, the Goatsucker has a very short and weak bill, and the feet also short and weak, so that it appears to have some difficulty in perching in the ordinary manner of the passerine birds; but when resting on the branch of a tree, places itself in the direction of the length of the latter, and crouches down closely upon it, as if fearful of falling off. The middle anterior toe is considerably longer than the lateral ones, and terminated by a long claw, which is singularly pectinated (fig. 104), or toothed like a comb along its inner edge. The number of teeth or serrations in a perfect claw are about ten, but the tip generally appears to be worn away, and thus the number is reduced to six or seven. The use of this pectinated claw has long been a puzzle to naturalists, and we can hardly say that its object has yet been thoroughly ascertained. White of Selborne, in one of his charming letters, writes as follows regarding an observation which he made upon one of these birds "as it was playing round a large oak that swarmed with *Scarabæi solstitiales*,

Fig. 104.



Foot of Goatsucker.

or Fern-chafers. The powers of its wing," he says, "were wonderful, exceeding, if possible, the various evolutions and quick turns of the swallow genus. But the circumstance that pleased me most was, that I saw it distinctly more than once put out its short leg whilst on the wing, and, by a bend of the head, deliver somewhat into its mouth. If it takes any part of its prey with its foot, as I have now the greatest reason to suppose it does these chafers, I no longer wonder at the use of its middle toe, which is curiously furnished with a serrated claw." Mr. Atkinson also takes this view, and mentions his having seen the Goatsucker taking its prey with its feet; adding, "Probably its serrated claw may assist this operation." Considerable doubt is thrown upon this view, however, by the position and nature of the serrations, and by the fact that the Goatsucker has never been seen, when in confinement, to seize insects with the foot. Moreover, the conformation of the mouth itself, so admirably adapted as it is for seizing insects on the wing, must be regarded as an additional argument against this view.

The opinion has been put forward by several ornithologists, and very generally received, that the middle claw of this bird was intended to be used for combing its moustaches, if we may use the expression, so as to free them from any fragments of its prey; but this notion is negatived by the fact, that the teeth are too close together to admit the bristles between them. Other opinions have been advanced by various naturalists; but the only one that deserves notice is that of M. De la Fresnaye, which indeed appears likely to be the true one. That distinguished ornithologist calls attention to the fact, that the Common Goatsucker, and all its immediate allies in which this form of claw prevails, rest upon the branches of trees in the direction of their length, so that they as it were ride upon the convexity of the branch. The structure of the feet, as M. De la Fresnaye points out, is wonderfully adapted to this peculiar position. The posterior toe is articulated to the inside of the extremity of the tarsus, and, as already stated, has a forward tendency. By this means the small sharp claw with which it is terminated is rendered available, like that of a thumb, for clinging to the back of a branch. This is also the case with the inner anterior toe; and the teeth of the inner margin of the middle claw will also evidently come into play, and give the bird a secure hold upon its seemingly precarious resting-place. If this explanation, which is certainly very plausible, be the true one, there can be no doubt that the Goatsuckers are especially organized for holding their peculiar position upon the branches; but the object of their taking such a position is still to be discovered.

The Goatsucker usually arrives in this country about the middle of May; so that it is, with one exception, the latest of all our migratory birds. It is also very early in taking its departure, quitting our shores at the end of August or the early part of September. Nevertheless, in this short period it finds time to distribute itself very widely over the country, as it is by no means confined to the southern parts of Britain, but is a common bird in Scotland, extending even to the most northern parts of that country. Occasionally, specimens are known to linger in the southern counties of England long after the main body has taken its departure; for individuals have been shot in Cornwall and Devonshire as late as the month of November.

In this country the Goatsucker is usually met with about moors, heaths, and commons; but it also frequents young woods. It is very fond of basking upon the ground in the sun, under the shelter of a bush; and when thus engaged, it lies very close, so that it may almost be trodden upon before it offers to move. Its period of activity is the twilight, when it may be seen hawking about after its favourite food; sweeping swiftly round the trees frequented by beetles and moths, of which it destroys great numbers. It is frequently asserted by ornithologists that the Goatsucker flies with its mouth wide open, gaping for its prey; and hence the French have given it the name of *Engoulevent*. This notion, however, appears to be erroneous, and the bird probably does not open his mouth until he is just about to seize his prey. The note of the bird, which is only emitted by the male, is a sort of whirring sound, compared by many writers to the noise made by a spinning-wheel; hence he is known as the *Wheel-bird* in some districts, and in others as the *Night-churr*, *Night-jar*, and *Churn-owl*. The Goatsucker is also called the *Night-hawk* and *Dor-hawk;* the latter name having reference to his predilection for night-flying beetles, which are often called *dors;* and likewise the *Fern-owl*, from his liking for fern brakes as a place of abode. The name of Goatsucker—which is applied to this bird in almost all languages, from the time of the Greeks and Romans, whose names *Ægotheles* and *Caprimulgus* had the same meaning, down to the present time—refers to the bird's supposed habit of sucking the milk of goats and other domestic animals during the night; a suspicion which has doubtless given the bird a bad character in the minds of many farmers, whilst, by the destruction of vast numbers of cockchafers, it is in reality one of their best friends. The cause of this opinion has been indicated by Le Vaillant. He says that there is no doubt that the Goatsuckers frequent the folds in which goats and sheep are penned up for the night, but that this is by no means with the felonious intention usually ascribed to them; on the contrary, they are attracted to such places solely by the numerous insects which are to be met with there, attracted in their turn by the accumulation of impurities. The shepherds and herdsmen noticing the birds descending among the animals under their charge, but not knowing their object in so doing, unfortunately put a wrong construction upon their proceedings, and thus fixed a somewhat libellous appellation upon a very harmless bird. Another curious notion has prevailed with regard to the Goatsucker, namely, that it not only flies with its mouth wide open, as already stated, but that in order to enable it to do this, the roof of the mouth is rendered transparent, so that the bird, whilst flying in pursuit of its insect prey, is enabled, *by turning its eyes downwards*, to see through the palate and thus direct its course. It is scarcely necessary to say that this idea is quite destitute of foundation. The roof of the mouth is indeed very thin and membranous, but by no means sufficiently translucent to allow any object to be seen through it; and, on the other hand, the eye is too completely fixed in its orbit to be capable of performing the singular movement, which would be necessary to enable it to take any part in such an unusual proceeding.

The eggs of the Goatsucker are usually two in number, of a white colour, clouded with bluish-grey. They are deposited in a depression or cavity on the surface of the ground under the shelter of a bush, generally with scarcely any attempt at a nest. In this country the eggs are deposited about the first week in June.

THE BOMBAY GOATSUCKER *(Caprimulgus asiaticus)*.—Several species of the genus *Caprimulgus* are found in India, and of these that called the Bombay Goatsucker by Latham is the commonest and most widely distributed, occurring abundantly in all parts of the peninsula. It also occurs in the Transgangetic countries. In its habits it resembles our British species, sheltering itself under hedges and bushes, and laying its eggs on the ground without a nest. The eggs are pink, spotted with brown. "The note of this species," according to Mr. Jerdon, "resembles the sound of a stone scudding on ice;" and Mr. Elliott compares it with the words *tyook*, *tyook*, *tyook*.

THE LARGE INDIAN GOATSUCKER (*Caprimulgus indicus*), which is as widely distributed as the preceding species, but far less abundant, is a large species of an ash colour, with numerous transverse black lines, and spotted with rusty red on the cheeks, breast, and wings. The tail is banded with black. This bird is found chiefly in the wooded districts of the Indian peninsula, where it passes the day under the shelter of the trees, and comes forth into the open country in the evening in pursuit of its prey. Its habits resemble those of the European species, and its note is something like that of the Bombay Goatsucker, being compared by Mr. Jerdon to the syllables *tew-yo-yo* frequently repeated.

THE COLLARED GOATSUCKER (*Caprimulgus pectoralis*), a native of the Cape of Good Hope, is distinguished by having an ash-coloured band on the breast. During the breeding season, which commences in the month of September, the male indulges in a very loud and singular song, which he begins about an hour after sunset, and often continues all night, if the weather be fine and light. Le Vaillant says that when he happened to encamp in the vicinity of these birds, the incessant song of the male rendered it impossible for him to sleep. The habits of the bird are very similar to those of the European species; the eggs are deposited on the ground, frequently even in the midst of a path, a custom which is not peculiar to the present species. Both the male and the female sit upon the eggs, and when thus engaged in an exposed situation they will remain at their post until the wayfarer is on the point of treading on them, when they rise almost from under his feet. Notwithstanding the little care which they seem to take to conceal their eggs, they are very jealous of these treasures, and remove them immediately on perceiving that they have been touched. Le Vaillant states that this removal is effected by the parents taking each an egg in their mouths, and flying off with them.

THE WHIP-POOR-WILL (*Caprimulgus vociferus*), one of the commonest American species of this genus, is found in most parts of the United States, where, however, it is a bird of passage, usually arriving from the south towards the end of April, and departing for its winter abode about the beginning of September. It measures nine inches and a half in length, and exhibits in its plumage a mixture of black, pale cream colour, brown and rusty red, "sprinkled and powdered in such minute streaks and spots," to borrow Wilson's words, "as to defy description." The tail, which is rounded, has the three outer feathers on each side blackish brown for half their length, and the remainder, to the tips, pure white; the four middle feathers are marked with herring-bone lines of black and yellow.

The Whip-poor-will usually resorts to elevated and dry situations, and is rarely seen or heard in low marshy districts. Like the preceding Goatsuckers, it is nocturnal in its habits, sitting close during the day in the most retired and shady spots to be found in the woods, or on the steep bushy banks of a creek or river. When disturbed in the day time, it sails slowly through the wood to a short distance, and then settles generally on a low branch of a tree. At dusk these birds issue from their concealment, and hawk about in the manner of their European congener in pursuit of night-flying insects; they are also said by Wilson to feed upon "grasshoppers, pismires, and such insects as frequent the bark of old, rotten, and decaying timber." Their note, which is emitted in the evening and night, especially during the breeding season, is described as distinctly resembling the syllables *whip-poor-will*, the first and last syllables being uttered with great emphasis, and the whole occupying about a second in its emission Between each repetition of the note a sort of cluck may often be heard by a person in the immediate vicinity of the bird; and when two males meet, their notes are reiterated rapidly and incessantly, as if each were straining to overpower and silence the other. Amongst the Indians this bird, from its nocturnal and noiseless activity and its singular note, became the object of some superstitious dread, in this respect sharing the evil repute of the owl. With the white settlers in the United States, however, the Whip-poor-will appears to be rather a favourite; for although Wilson tells us that the shrill and confused clamours of these birds, as evening draws on, are very surprising to a stranger, he adds that "they soon become extremely agreeable. The inhabitants lie down at night lulled by their whistlings, and the first approaches of dawn are announced by a general and lively chorus of the same music; while the full-toned *tooting*, as it is called, of the pinnated grouse, forms a very pleasing bass to the whole."

The female begins to lay about the second week in May, and, like her European relative, takes no trouble in preparing a nest, but deposits her eggs either on the bare ground or on a few dry leaves. She always selects a dry situation, in the most sequestered part of the wood.

THE CHUCK-WILL'S-WIDOW (*Caprimulgus carolinensis*), is another American species, the somewhat singular name applied to which has been derived from its note. This remarkable cry is said by the American writers to resemble the words *Chuck-will's-widow*, each syllable being slowly and distinctly pronounced, with the principal emphasis laid on the last word. It is so loud that in a still evening it may be heard at a distance of nearly a mile; and in those districts where the birds are numerous, their incessant vociferation makes the mountains ring with echoes during the whole evening. In general the note is heard only in the morning and evening, but on moonlight nights it is continued throughout the whole night.

Like the preceding species, the Chuck-will's-widow is a migratory bird, arriving in the southern states of the American Union about the middle of March, and gradually extending itself towards the north. It retires from the United States early in September. In its habits it resembles the Whip-poor-will, passing the day in concealment in thick woods and wooded glens, and issuing forth at sun-down in pursuit of insects. It flies low, and frequently settles on old logs or on fences, from which it dashes off again after its prey. The eggs, two in number, are laid on the ground, without any nest, and the birds exhibit the same jealousy of having them touched which we have already described in the case of the African Collared Goatsucker, and which is probably common to most birds of this group. In illustration of this peculiarity, we may quote the following account given by Audubon:—"The negroes," says that celebrated ornithologist, "some of whom pay a good deal of attention to the habits of birds and quadrupeds, assured me that these birds push the eggs or young with their bill along the ground. Some farmers, without troubling themselves much about the matter, imagined the transportation to be performed under the wings of the old bird. The account of the negroes appearing to me more likely to be true than that of the farmers, I made up my mind to institute a strict investigation of the matter. The following is the result:—When the Chuck-will's-widow, either male or female—for each sits alternately—has discovered that the eggs have been touched, it ruffles its feathers, and appears extremely dejected for a minute or two, after which it emits a low murmuring cry, scarcely audible to me as I lay concealed at a distance of not more than eighteen or twenty yards. At this time I have seen the other parent reach the spot, flying so low over the ground that I thought its little feet must have touched it, as it skimmed along; and after a few low notes and some gesticulations, all indicative of great distress, take an egg into its large mouth, the other bird doing the same; when they would fly off together, skimming closely over the ground, until they disappeared among the branches and trees." From an observation of Wilson's it would appear that the Whip-poor-will also removes its young from a spot where it apprehends that they are in danger.

THE SPOTTED-WINGED GOATSUCKER (*Eurostopodus guttatus*).—The true Goatsuckers are represented in Australia by two species belonging to a peculiar genus, to which Mr. Gould has given the name of *Eurostopodus*, in allusion to its stout feet. The Spotted-winged Goatsucker is about eleven inches long, and its plumage is generally of a grey colour, minutely freckled with black, and having many of the feathers edged with buff. The quill feathers of the wings are brownish black, the secondaries with numerous buff, and the first four primaries with large pure white spots, forming a band upon the wing. On each side of the throat there is a large streak of white, which also occurs in the other species. Little is known of the habits of this bird, which is distributed over all the southern parts of the Australian continent. Like the preceding species, it breeds on the ground, and is nocturnal in its habits. Mr. Gould states that when flushed in the daytime, it mounts rapidly into the air, performs a few zigzag evolutions, and then pitches down again upon the earth at a distant spot.

THE WHITE-THROATED GOATSUCKER (*Eurostopodus albogularis*), has only been met with in New South Wales, where it is not uncommon, but appears to be a summer bird of passage. It measures about a foot in length, and is of a far more dusky plumage than the preceding species, which it also exceeds in the length of the wings, the tips of the primaries reaching as far as the end of the tail. In accordance with this, Mr. Gould says that its flight is more powerful than that of any other goatsucker that he has seen; it dashes through the air with great rapidity, and rises or descends almost perpendicularly whenever an insect comes within its reach. Its food consists principally of beetles and locusts, some of them so large as to render it surprising that they can be swallowed by the bird, especially as they are sometimes so little injured by the process, that Mr. Gould preserved them for his entomological collection.

THE LEONA GOATSUCKER (*Macrodipteryx longipennis*)—Plate 6, fig. 18—is remarkable for having an exceedingly long feather, measuring sometimes twice the length of the body, springing from each wing, but furnished with barbs only at the extremity, the remainder of the feather constituting a bare shaft. This curious appendage, which is peculiar to the male, is not, according to Mr. Swainson, one of the ordinary quill feathers of the wing, of which the same number exists in both sexes, but a supplementary feather, arising from the bend of the wing, between the primaries and secondaries. Its object—if, indeed, it serves any special purpose—is quite unknown, and it seems probable that, like so many other extraordinary developments in animals, they are to be regarded solely as ornaments; but, in the absence of information upon the habits of the bird, the question cannot be decided. The Leona Goatsucker usually measures about eight inches in length, and in its general appearance resembles our European species.

THE VIRGINIAN GOATSUCKER (*Chordeiles virginianus*), called the NIGHT HAWK by many American writers, is a well-known migratory bird in the United States, where it arrives in the month of April, returning again towards the south about the middle of August. It measures rather more than nine inches in length, and is of a general blackish-brown colour, thickly sprinkled above with minute spots and streaks of cream colour and pale red. The tail is forked, and all the feathers composing it, with the exception of the two middle ones, are barred with white nearly to the tip, where they are crossed by a broad white band; the first five primaries of the wing are also marked with a broad white band, and there is a triangular spot of white on the throat. The gape is destitute of bristles. The Virginian Goatsucker is met with in all parts of the United States, and also in Canada and Nova Scotia, where it appears to be very abundant. Its habits resemble those of the other Goatsuckers, the evening being its principal period of activity, except in wet gloomy weather, when it often comes abroad in the daytime, generally flying at a considerable height. It is strong on the wing, and executes the most varied movements in the air with great agility, as it becomes necessary to change its course in order to capture its insect prey. Unlike the preceding species, which generally reside wholly in rural districts, the present bird will venture boldly into the towns and cities, where it may be seen sitting on the chimney tops. Whilst engaged in the pursuit of insects in the air, this bird emits a singular cry, compared by different hearers to the syllables *piramidig* or *gi' me a bit*, or, according to Mr. Gosse, *wittawitawit*. In descending perpendicularly, which this bird will often do to a distance of sixty or eighty feet with great rapidity, it produces a loud booming sound, very much resembling that caused by blowing strongly into the bunghole of an empty cask. This manœuvre is frequently repeated. The eggs are deposited about the middle of May, and, as with the other Goatsuckers, are laid upon the ground without any nest.

THE NACUNDA GOATSUCKER (*Podager Nacunda*), a Brazilian species, which migrates southwards in the summer, is usually met with in the open country, where it is said by Azara to prefer moist places. It often pursues its insect prey by daylight, whence it has been called the DIURNAL GOATSUCKER by some ornithologists.

THE GREAT IBIJAU (*Nyctibius grandis*).—This bird, which is a native of South America, belongs to a genus strikingly distinguished by several very peculiar characters from the group formed by the preceding species. In these birds, of which seven species are known, the bill is considerably longer than in the true Goatsuckers, but almost entirely membranous in its structure; the only horny parts being the ridge of the upper mandible, and the somewhat hooked tip with which it is terminated. The margins of the upper mandible are furnished with a soft process or tooth, and the whole of the lower mandible is completely concealed beneath the upper one when the mouth is closed. The tarsi are shorter than even in the true Goatsuckers, scarcely equalling in length one of the joints of the toes; they are stout, and clothed with feathers. The toes are better adapted for grasping than in the preceding species, the posterior one in particular being much longer and stronger, and articulated at the back of the tarsus instead of at the side. The claw of the middle toe is slightly dilated, but not denticulated on the inner side. The habits of the birds are in accordance with this striking difference in the construction of the feet. Instead of dwelling on the ground, they take up their abode amongst the branches of trees, and, singularly enough, usually attach themselves, in the manner of the Woodpeckers, to the extremity of a broken branch. Here they remain with the body in a vertical position, and supported on the tail, the feathers of which are always more or less worn, with about half the body projecting beyond the branch; by which means, as their plumage is nearly of the same colour as the bark, and they remain for a long time quite motionless, it becomes very difficult to discover them.

The Great Ibijau measures nearly twenty inches in length, and is of a brown colour, spotted with black, buff, and white. It is nocturnal in its habits, flying about like the ordinary Goatsuckers in pursuit of night-flying insects. It lays its eggs and brings up its young in a small hollow in a tree, without making any nest. Azara mentions that it is a common opinion that these birds not only make no nest, but that they stick their eggs to trees by means of some sort of glue or gum, and that, when the young are ready to be hatched, they or their parents break off the upper half of the egg, leaving the lower part sticking to the tree.

THE JAMAICA IBIJAU (*Nyctibius jamaicensis*), or POTOO, which is found not only in Jamaica, but also in Brazil and other parts of the South American continent, is a smaller bird than the preceding, which it somewhat resembles in the tints of its plumage. In Jamaica it sometimes flies by day, but its regular period of activity is the evening, when it flits about with noiseless wings, or takes its station on a dead tree or fence. Mr. Gosse, judging from the habits of a specimen which he had alive, thinks that the bird, notwithstanaing its large and powerful wings, flies but little, and that it watches for the insects on which it preys from a resting-place, and dashes after them when they come in sight, somewhat in the manner of the Flycatchers. According to the writer just quoted, this bird feeds upon the large, hard, and horned beetles which abound in tropical countries, as the well-known dung-beetles do here. Its cry is a loud and hoarse *ho-hoo*. The eggs of the Potoo are deposited on the ground, but, unlike the ordinary Goatsuckers, it makes some little attempt at nest-building. Mr. Gosse says, "I have seen that which serves this bird for a nest: it is simply a round flat mat, about four inches wide, composed of the fibrous plant called Old Man's Beard (*Tillandsia usneoides*)." This is a singular moss-like plant which grows upon the branches of trees, from which it hangs down like a great white beard.

THE GUACHARO (*Steatornis caripensis*), also known as the OIL-BIRD and the TRINIDAD GOATSUCKER, is another very remarkable species of this family, which inhabits the tropical regions of America. For our knowledge of the natural history of this bird, we are principally indebted to the celebrated traveller Humboldt. It is about the size of a pigeon, measuring eighteen inches in length including the tail, which is long; the bill is long, hooked, and robust, although very broad at the base and depressed; the nostrils are large, pierced near the middle of the sides of the bill, and overarched by some long stiff hairs springing from its base; the tarsi exhibit no scales or plates, the toes are of moderate length and strength, and the middle claw is neither dilated nor serrated on its inner margin. The general tint of the plumage is sombre, consisting, as usual in the present family, of a mixture of minute dots of black, brown, grey, and reddish, but marked on the head and neck, and on the wing and tail feathers, with white spots of variable form and size.

These birds are found in Trinidad, and in several parts of the north of South America. They are nocturnal birds, and pass the day in the recesses of caverns in the mountains, where they collect in vast bands. Unlike the other species of this family, the Guacharos feed entirely upon fruits and seeds, no insects having ever been met with in their alimentary canal; the food of the young also consists of the same matters, and hence a great accumulation of fat is produced in them, especially in the peritoneum. This furnishes an excellent oil; and the Indians of those parts of South America where the birds occur, destroy great quantities of the young every year in order to obtain a supply of this grease. The most noted locality for this oil-harvest is a cavern at Caripe, called from this circumstance the *Cueva del Guacharo.* Into this cave, as Humboldt tells us, the Indians enter once a year, about the festival of St. John. They take with them long poles, with which they destroy all the nests within reach, and thus kill many thousands of the young birds. The nests are found in holes of the walls of the cave. During this process the old birds, as if to defend their broods, sail over the heads of the Indians uttering the most discordant cries. The young birds are immediately opened, and the fat removed from them: it is afterwards melted in clay pots at the entrance of the cavern. The oil thus obtained is semi-fluid, transparent, and inodorous, and so pure that it may be kept more than a year without becoming in the least rancid. It is employed in cooking.

The annual destruction of these birds is so great, that, as Humboldt remarks, the whole race would soon be extinct, were it not for certain circumstances which favour the preservation of the species. The birds doubtless breed in many caverns which are never visited by the oil-gatherers; and even in the cavern of Caripe, the voices of these birds are heard in galleries to which the Indians never penetrate, partly perhaps from their inaccessibility, but principally on account of certain superstitious notions connected in their minds with the cave and its inhabitants. Humboldt, describing his visit to the cavern of Caripe, says—"We had much trouble in persuading the Indians to pass the anterior portion of the cave, the only part which they frequent in their annual collection of fat. It required all the authority of the *padres* to make them advance as far as a spot where the ground rises suddenly at an angle of sixty degrees, and where the torrent forms a small subterranean cascade. The natives attach mystical ideas to this cavern, inhabited by nocturnal birds. Man, they say, should dread places which are lighted neither by the sun nor by the moon. To go to the Guacharos, is to join one's fathers, to die."

This celebrated cavern is pierced in a vertical rock: its entrance measures eighty feet in width, and seventy-two feet in height; and through the cave there runs, as indicated in the above extract, a subterranean torrent. For a distance of upwards of four hundred feet, the daylight still struggles with the darkness of the cavern; and the seeds brought in by the birds to feed their young, but accidentally dropped by the way, germinate in the scanty soil of the floor, producing etiolated plants, which, as Humboldt remarks, might be taken for the phantoms of plants banished from the outer world. Further in, the loud and discordant cries of the Guacharos were heard, repeated and increased by the echoes on every hand. The seeds found in the crops of the young birds opened in the cavern are supposed by the Indians to possess medicinal virtues, and are carefully preserved under the name of *Semilla del Guacharo.*

THE NEW HOLLAND GOATSUCKER (*Ægotheles Novæ Hollandiæ*).—The remainder of the birds of this family form three genera, the members of which are almost entirely confined to Australia and the islands intervening between that continent and Asia, the majority of the species being natives of Australia.

The New Holland Goatsucker is a charming little species, measuring only about nine inches in length. It has a very broad depressed bill, of which, however, only the tip projects beyond the forehead, and the whole gape is bordered above with numerous long bristles, many of which are furnished with little barbs. The plumage is mottled with grey and brown, paler beneath; a greyish white collar runs round the neck, and there is a crescent-shaped spot of the same on the back of the head. The tarsi are long and slender. This species is met with all over the southern parts of Australia, and also in Van Diemen's Land, where it is known, according to Mr. Gould, as the *Little Morepork,* a name which will be explained when we come to describe the *Podargi.* It is a somewhat solitary bird, more than two being rarely found together; its habits are nocturnal, and it feeds upon night-flying or crepuscular insects, being especially fond of mosquitoes, according to M. Jules Verreaux. During the day it dwells in the *spouts* or hollow branches of the trees, and when disturbed in its retreat, makes a hissing noise like the owl, which it also resembles very closely in its carriage. When the trunk of the tree on which it has taken up its abode is tapped with a stone, the little inmate will ascend in his spout and peep out to see whether he is threatened with any danger. If the tree be lofty, he again descends in his dwelling; but if the noise be repeated, or the disturbance about the tree continue, he flies off to another tree which offers a similar refuge. It is in these cavities, without making any nest, that the female deposits her eggs and brings up her young. The eggs are four or five in number; and Mr. Gould states that at least two broods are reared by each pair of birds in the year.

THE TAWNY-SHOULDERED PODARGUS (*Podargus humeralis*). The *Podargi,* which are peculiar to Australia and New Guinea, in which countries about eight species have been discovered, are amongst the largest species of this family, and distinguished from the preceding species by a much greater strength of bill. The head is of large size, and the gape enormously wide; the feet are stout, and the outer toe has a certain power of being reversed. The Tawny-shouldered Podargus, which is one of the commonest Australian species, is about seventeen inches in length, including the rather long tail; it is of a greyish-brown colour, mottled and spotted with brown, and the wing coverts are spotted with white and tawny, the spots forming irregular bands across the wings when these are closed. The bristly feathers above the base of the bill are more or less plumose.

This bird is found abundantly in New South Wales, and also in Van Diemen's Land, where it dwells amongst the trees, sleeping during the day upon a branch in so lethargic a condition that it is almost impossible to arouse it; it may then be taken by the hand, or knocked down with a stick or stone, and Mr. Gould says that he has even shot one without disturbing its mate sitting by it. At night, however, it becomes active and animated, but its powers of flight seem to be inferior to those of the goatsuckers in general, and from the nature of its food, which consists to a great extent of insects which do not move at night, such as *Cicadæ* and *Phasmidæ*, we may judge that it finds much of its sustenance by creeping about the stems and branches of trees, in the crevices of the bark of which these insects conceal themselves at night. This view is borne out by the subscansorial character of the feet, and the worn state in which the feathers of the tail are usually found. The stomach, according to Mr. Gould, is "lined with a thick hair-like substance, like that of the common cuckoo," and as the latter is known to consist of the hairs of caterpillars, we may infer that these insects form a portion of the food of this *Podargus*. During the winter season it feeds upon beetles and, when other resources fail, also upon small terrestrial Mollusca. According to M. Verreaux, in the breeding season their tastes become carnivorous; they devour small birds, which they seize upon the nest. M. Verreaux says that when the birds are rather large, he has seen the *Podargus* take his prey to a large branch, seize it by the head, and beat it right and left against the branch so as to break its bones, when he swallows it whole, commencing with the head. The cry of this species is a loud hoarse note, which, Mr. Gould says, cannot be accurately described. During the pairing time the male uses a note which, as described by M. Verreaux, resembles the cooing of a dove more than the cry of a night bird, and which appears to have a great attraction for the female. The males also fight fiercely at this season. The eggs, which are usually two or three, of a pure white colour, are deposited in September, in a flat nest composed of small twigs, and placed on the fork of a horizontal branch, at about five or six feet from the ground.

CUVIER'S PODARGUS (*Podargus Cuvieri*) is a rather smaller species than the preceding, measuring only fifteen or sixteen inches in length; it is also destitute of the large tawny spots on the shoulders, and the bristles over the base of the bill have only a few distant barbs upon them. This species, although met with on the continent of Australia, is more especially an inhabitant of Van Diemen's Land, where it is known to the colonists as the *More Pork Bird*, its curious cry being considered to bear a close resemblance to the words "more pork." In its habits it resembles the preceding species, but its nest is said to be more neatly formed.

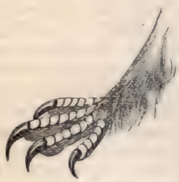
Of the remaining species of this genus we need only mention the MOTH-LIKE PODARGUS (*Podargus phalænoïdes*), a small species found at Port Essington, and in other parts of North Australia; and the PLUMED PODARGUS (*P. plumiferus*), which is remarkable for a large tuft of light feathers springing from above the base of the bill. The latter is rather a large species, measuring eighteen inches in length, including a long tail slightly forked at the tip; it is found in New South Wales. The NEW GUINEA PODARGUS is called *P. papuensis*; it is a large species.

HORSFIELD'S GOATSUCKER (*Batrachostomus javensis*). The islands of the Eastern Archipelago are inhabited by several species of this family, nearly allied to the *Podargi*, but possessing a still more strongly developed bill. The Javanese species, known as Horsfield's Goatsucker, inhabits the recesses of large forests, but nothing is known of its habits. In another species, the GREAT EARED-GOATSUCKER (*B. auritus*), the face is ornamented with a pair of large tufts of light feathers, projecting horizontally, and giving the bird a very singular and grotesque appearance.

FAMILY II.—CYPSELIDÆ.

The birds forming the family of the *Cypselidæ*, or *Swifts*, are very commonly placed in the same family as the Swallows, which they closely resemble in most of their external characters. They have a very short, weak, and depressed bill, with the gape opening back as far as the hinder margin of the eyes, and entirely destitute of bristles. The nostrils are of very large size, situated on the upper surface of the base of the bill, and surrounded by raised margins. Their feet are very short and weak; and in the typical species, forming the genus *Cypselus*, all the four toes are directed forwards. This arrangement of the toes adapts the feet admirably for clinging to walls, rocks, and similar objects, about which the Swifts commonly take up their abode; but the weakness of their hinder limbs renders them all exceedingly helpless on the ground, to which indeed they rarely descend of their own accord. When driven to the earth by any accident, they remain crouching where they fall, or creep along lamely until they can reach some slightly elevated object on which they can climb, and thus obtain a point of vantage from which to start into the air. In the last-mentioned element, however, their means of locomotion are perfect; in fact, they probably exceed all other birds in power of flight. Their wings are excessively long and pointed, and moved by strong muscles attached to an enormously-developed sternal keel; and by the rapid vibration of these vigorous pinions, the little birds are enabled to perform the most astonishing aërial evolutions. Nearly their

Fig. 105.



Foot of Swift.

whole time is passed in the air in pursuit of the insects on which they feed. Their behaviour in this incessant flight is very similar to that of the still better known swallows, although they display even more activity. To show the rapidity of flight possessed by some of these birds, we may quote a calculation made by Le Vaillant with regard to an African species which he calls the *Martinet Vélocifère.* "In flying," says the African traveller, "it passes over a space of one hundred toises in five seconds, as I have ascertained several times upon a measured ground. Thus, supposing that the bird would or could continue its flight with the same rapidity, it would be scarcely a minute in travelling half a league; and, consequently, would only take a fortnight in going round the world."

The Swifts also present some anatomical characters which seem to corroborate the justice of their separation from the Swallows. In the first place, the inferior larynx is destitute of those muscles, by the agency of which singing birds are enabled to modulate their notes, and which are present in the swallows; hence, with those authors who adopt the division of the passerine birds into two great sections, according as they do or do not possess the organs of song, the separation of these two families would become still wider than we have made it. Secondly, there is a difference in the form of the sternum: the Swallows, like all the other singing birds, having the posterior margin of this bony plate deeply notched, whilst in the Swifts it is entire—a character which is strongly in favour of the view held by some ornithologists, that the Swifts are really allied to the Humming-birds, which possess a very similar sternum, and present other resemblances too striking to be overlooked.

The Swifts, like the Swallows, and indeed like most purely insectivorous birds, are migratory in the colder and temperate climates. Our European species arrive here later, and leave earlier, than the Swallows. They usually frequent old walls and buildings, or rocks, in the holes or crevices of which they breed, often without any attempt at building a nest. We now proceed to notice a few of the most remarkable members of this family, commencing with—

THE COMMON SWIFT (*Cypselus apus*)—plate 5, fig. 15—as the best known species. In this bird the typical characters of the Swifts are well shown: the small weak bill, the large, oblong nostrils, the extremely long, curved, nearly sabre-shaped wings—reaching when closed far beyond the extremity of the slightly-forked tail—and the small weak feet, are all exhibited most distinctly by our Common Swift, which also presents another character already referred to, but not common to the other genera of the family, namely, that all the four toes are directed forwards (fig. 105). These characters belong to the typical genus *Cypselus*. The Common Swift is of a uniform blackish-brown colour, slightly glossed with green, except on the chin, which is occupied by a greyish-white patch. The total length of the bird is about seven inches and a half, and the wings usually extend fully sixteen inches—an immense stretch, when we consider the small size and lightness of the body.

The Swift, as already indicated, is a summer visitor to Europe, and usually arrives in this country about the beginning of May. It leaves us again generally by the middle of August, so that its stay in Britain hardly exceeds three months; and it is remarkable that the birds quit even Italy towards the end of August to cross the Mediterranean on their way to their African winter-quarters. On the continent of Africa our Common Swift is said to advance even to the Cape of Good Hope, although the majority probably stay within the tropics as asserted by Temminck. In Asia these birds are met with as far to the east as lake Baikal, and specimens have been killed in India. Like some other migratory birds, the Swifts will often return after an absence of eight or nine months, and a voyage of several thousand miles through the trackless fields of air, to the very same spot where they had built their nests and reared their young the year before. Dr. Jenner ascertained this with regard to the Swift by an experiment which he describes in the following words:—"At a farm-house in this neighbourhood" (Berkeley in Gloucestershire), he says—"I procured several swifts; and, by taking off two claws from the foot of twelve, I fixed upon them an indelible mark. The year following, their nesting-places were examined in an evening when they had retired to roost, and then I found several of the marked birds. The second and third year a similar search was made, and did not fail to produce some of those which were marked. I now ceased to make an annual search; but, at the expiration of seven years, a cat was seen to bring a bird into the farmer's kitchen, and this also proved to be one of those marked for the experiment."

On its arrival the Swift takes up its abode in holes and other sheltered places in church-steeples, towers, ruins, and under the eaves of houses. From these concealed nooks and corners, it dashes forth in fine weather to wheel about in the air with inconceivable rapidity in pursuit of insects, accompanying its headlong flight with loud screaming notes; but when the day is unfavourable, and especially when there is a high wind, the Swifts, notwithstanding their power of wing, usually keep close within their snug retreats. Their food consists entirely of insects, which they capture and devour, as previously stated, on the wing. They do not indeed appear always to swallow their insect prey as soon as it is caught; but as it usually consists of gnats, midges, and other small compressible insects, they seem to prefer collecting a sufficient number in their mouths before swallowing them, to make it worth their while to do so. The insects caught for the nourishment of the young are also carried and collected in the same way, so that it is rarely that a Swift is killed without some insects in its mouth.

The nest is built in one of the ordinary holes inhabited by the birds. It is composed of fragments of straw, dry grass, and bits of rag, with a few feathers; and these materials are glued together by degrees, especially after the nest has been inhabited for several successive seasons, by means of a sort of glutinous secretion produced by the largely-developed salivary glands with which the Swifts in general are endowed. The eggs are usually two in number, but vary from two to four, the latter number being rare. The young are hatched about the end of June, but do not leave the nest till the end of July. During all this period the parents attend to and feed them with great care, supplying them with abundance of food, although they allow rather longer intervals to elapse between their visits to the nest, than is usual with birds when bringing up their young. After the young birds have come out, they receive little attention from their parents, but are left pretty much to shift for themselves; this, however, they are well able to do, and, indeed, within a very short time after their first initiation into the cares and perils of the outer world, they are strong enough to undertake a long journey into unknown regions. It sometimes happens that the first eggs are destroyed by some accident; and in this case, the Swifts lay a second time. Some curious examples of this have been recorded. Gilbert White, writing in 1781, says—"Our swifts in general withdrew this year about the first day of August—all save one pair, which, in two or three days, was reduced to a single bird. The perseverance of this individual made me suspect that the strongest of motives, that of an attachment to her young, could alone occasion so late a stay. I watched, therefore, till the twenty-fourth of August, and then discovered that, under the eaves of the church, she attended upon two young which were fledged, and now put out their white chins from a crevice. These remained till the twenty-seventh, looking more alert every day, and seeming to long to be on the wing. After this day they were missing at once; nor could I ever observe them with their dam coursing round the church, in the act of learning to fly, as the first broods evidently do. On the thirty-first, I caused the eaves to be searched; but we found only two callow dead swifts, on which a second nest had been formed." In this instance, it is evident that by some accident the first brood had been destroyed, that a second nest had been made over them, and a second brood produced; that the male, yielding to the strong impulse to migration, coolly took his departure, leaving the cares of the family to his mate; and that the latter, faithfully discharging the duty thus imposed upon her, remained for nearly a month, after the main body of her species had started on their journey southward.

In another case recorded by Mr. Salmon in the *Magazine of Natural History*, the male bird behaved in a manner more consistent with his duty, and remained to share with his partner in the trouble of rearing their little family. In this instance also his forbearance was far more severely tried than it could have been in that observed by White, for on the second of September the young birds found in the nest did not seem to be more than a week old, and it was not until the first of October that they were ready to fly; three days afterwards the whole family disappeared. Single specimens, probably detained much in the same way as those just mentioned, have been met with even later in the season in various parts of this country; thus Mr. Blackwall records his having seen one on the 20th October; one was seen in Perthshire on the 8th November, 1834; and another in Devonshire in 1835, as late as the 27th November.

THE ALPINE SWIFT (*Cypselus melba*), also called the WHITE-BELLIED SWIFT, is recorded as a second British species, some half a dozen specimens having been killed at different times in this country. Its true European home, however, is amongst the Swiss Alps and other high mountain ranges of the South of Europe; it ranges eastward through Greece and Turkey into Asia, where it has even been met with in India, and in Africa it migrates southwards to the vicinity of the Cape of Good Hope. Its coloration is very different from that of the Common Swift. The whole of the upper surface is of a greyish-brown colour, as are also a band round the neck, the thighs, chest, and under tail-coverts; the chin and throat, the lower parts of the chest and the belly are white. The length, to the extremity of the tail, is from eight to nine inches, and the expanse of the wings about twenty or twenty-one, so that in this respect it exceeds even the Common Swift. The rapidity of its flight is also described as greater than that of the preceding species, with which it agrees in its general habits.

THE WHITE-RUMPED SWIFT (*Cypselus affinis*) is a common species in India, where it is very generally distributed. It is called the *Ababeel* by the Hindoos. It haunts pagodas, choultries, and other buildings, and makes its nest—which is composed of straw, grass, feathers, and other soft substances, mingled with clay —in the numerous crevices with which these edifices usually abound. The nests are usually built close together, but so as to be concealed wholly or partially by a beam, rafter, or some similar object lying before them.

THE BATASSIAN SWIFT (*Cypselus batassiensis*), another abundant Indian species, is said by Dr. Buchanan Hamilton, to be "a nocturnal bird, appearing at sunset, and going to rest at sunrise." According to the same authority, its Bengalee name, *Batassia*, "signifies a bird resembling wind, and is bestowed on this species on account of its swift flight." It frequents the groves of palms, especially those of the Palmyra or Tal (*Borassus flabelliformis*), on the fan-like fronds of which it builds its nests. These little birds are sociable in their habits, as many as twenty or thirty pairs being often met with upon a single palm-tree; and they also live in great harmony with their feathered neighbours of other species, for Mr. Blyth states, that it is "rare to meet with one of the same palms clustered with the pensile nests of the Baya (*Ploceus philippensis*), that does not also harbour two or three pairs of this elegant little Palm Swift."

THE JAMAICA PALM SWIFT (*Cypselus phœnicobius*), regarded by M. Gosse, its first describer, as the type of a new genus which he denominates *Tachornis*, appears to be peculiar to the magnificent island of Jamaica, where it resides all the year round. The plumage of the upper parts of this interesting bird is of a smoky black colour, becoming brownish on the head; the sides of the body beneath are also smoky black; but the chin and throat, and the middle line of the belly, are white, and there is also a broad white band crossing the rump above, but this is often nearly divided into two spots by a black line descending from the back.

Mr. Gosse's account of the habits of this Palm Swift is so admirable, that we cannot do better than extract it. He says—"Over the grass-pieces and savannas of the lowlands, the marshy flats at the seaward mouths of the valleys, as well as the pens of the mountain slopes, this swift-winged sylph daily urges its rushing course, in parties of half a dozen to fifty or a hundred, often mingled with other swallows, performing mazy evolutions, circling and turning, crossing and recrossing, now darting aloft, now sweeping over the grass, till the eye is wearied with attempting to follow them. The length of its wings, which is scarcely less than that of the whole bird, renders it a fleet and powerful flyer; an attentive observer will be able to identify it, when mingling in aërial career, by a more frequent recurrence of the rapid vibration of the wings, the momentary winnowing, by which a fresh impetus is obtained." But the most curious part of the history of this bird is its nidification, which is described by Mr. Gosse as follows. After mentioning the mode in which his attention was called to a cocoa-nut palm, by his noticing these swifts about it, some of them clinging to masses of cotton projecting from the spathes, he says, that although several other cocoa-nut trees were about, none of them appeared to be tenanted, so that this swift, like the preceding, is evidently sociable in its habits. The first tree could not be climbed, but at the foot of another "lay the dead fronds, spadices, and spathes, which had been, in the course of growth, thrown off, and in these were many nests. They were formed chiefly in the hollow spathes, and were placed in a series of three or four in a spathe, one above another and agglutinated together, but with a kind of gallery along the side, communicating with each. The materials seemed only feathers and silk-cotton (the down of the *Bombax*); the former very largely used, the most downy placed within, the cotton principally without, the whole felted closely and cemented together by some slimy fluid, now dry, probably the saliva." Mr. Gosse afterwards procured some nests of this bird, which were composed almost exclusively of the silk-cotton, and which, when separated, had a curious hairy appearance, not unlike a doll's wig. These nests were attached to the fronds of the cocoa palms, and resembled in form those watch-pockets which are often suspended at the head of a bed.

THE ACULEATED SWIFT (*Acanthylis pelasgia*) is a native of the United States, where it is known as the CHIMNEY SWALLOW, from its habit of building in the chimneys in the summer, like our Common Swallow. It is, however, a member of the family *Cypselidae*, although differing from the species of the group previously described, in the structure of the feet, which have three toes in front and one behind; this character also prevails in the remaining species of this family. The genus *Acanthylis* is distinguished from the other Swifts by the peculiar construction of the tail, which is short and somewhat rounded at the extremity, where the shafts of the feathers project for some distance beyond the barbs in the form of bare spines, which serve to support the bird by pressing against the walls or other objects to which it clings. These birds are also remarkable for the great extent of their wings in comparison with their bulk; the Aculeated Swift of North America, which measures only about four and a half inches in length, having wings extending twelve inches from point to point! The whole of the plumage is of a deep sooty-brown colour, with the exception of the chin and a line over the eye, which are of a dull white; the tail is black, and the short but muscular feet are of a purple colour.

The Aculeated Swift, like the majority of the insectivorous birds of temperate climates, is migratory in its habits, arriving in the United States about the end of April or early in May, and taking its departure again towards the south in the first or second week in September. On their arrival they appear to take up their abode in multitudes in the interior of hollow trees, from which they are seen emerging with great noise in the morning, returning to their resting place at night in similar crowds. This circumstance led some of the earlier observers of the habits of American birds to the conclusion that these Swifts passed the winter in a torpid state in these hollow trees, which hence acquired the name of *Swallow-trees*, and at the first glance there is some plausibility about this notion. Thus, the birds were first observed about the trees early in May, that is to say, in the spring, and they were last seen entering in September; so that as the trees were always respected by the settlers, it was perhaps natural for them to suppose that the Swifts remained in this comfortable abode throughout the winter. It was found, however, even in Wilson's day, when the upper portion of one of these swallow-trees was blown down in the winter, that there were no Swifts in the part of the tree broken off; and the birds never returned to the remaining stump. It is evident therefore, independently of our knowledge of the migratory habits of birds of this kind, that these Swifts do not pass the winter in their hollow trees, and that the notion that they did so originated simply from their making their way directly, and in considerable numbers to their ordinary places of abode, and departing again as suddenly in the autumn. Wilson supposes that before the arrival of Europeans in America, this bird must have built its nest in such hollow trees as those above mentioned, and adds that this is still its practice in the remote western districts where chimneys are comparatively unknown luxuries; but in the older states, the Aculeated Swift quits the rustic abode in which it takes up its residence on its first arrival, and proceeds to build its nest within the chimneys, which are, of course, disused during the summer. The nest resembles those of most Swifts, in being composed of small twigs and similar articles united together by a glutinous matter. It is small and shallow, and attached by one side to the wall of the chimney; its cavity has no soft lining of feathers, and it usually contains four white eggs. The birds generally have two broods in a season. They feed their young with great care, and even continue their attentions to them throughout the night. Sometimes when there has been a long continuance of heavy rain the nest becomes softened and loosened from the wall, when it, with its contents, is precipitated to the bottom. If it contains eggs they are of course destroyed; but when this accident happens after the hatching of the young, these, although they may be still blind, frequently climb up again into the chimney, clinging like squirrels by means of their strong feet and sharp claws. The young birds are indeed so conscious of the power of their feet, that it is not uncommon for them to quit the nest voluntarily long before they can fly; they then cling firmly to the wall, and are fed there until they can dart off in pursuit of their own prey.

Wilson says that "the Chimney Swallow is easily distinguished in the air from the rest of its tribe, by its long wings, its short body, the quick and slight vibrations of its wings, and its wide unexpected diving rapidity of flight; shooting swiftly in various directions without any apparent motion of the wings, and uttering the sounds *tsip tsip tsip tsee tsee* in a hurried manner. In roosting, the thorny extremities of its tail are thrown in for its support. It is never seen to alight but in hollow trees or chimneys; it is always most gay and active in wet and gloomy weather; and is the earliest abroad in the morning, and latest out in the evening of all our swallows."

THE NEEDLE-TAILED SWIFT (*Acanthylis caudacuta*) of Australia, is a considerably larger bird than the preceding, measuring seven inches in length to the extremity of the tail, whilst the wings are of immense extent, measuring no less than nine inches from the wrist-joint to the tip, and thus extending at least three times the length of the bird. Its general colour is brown: the wings, tail, and crown of the head, are deep, shining green; the throat and chin, a band above the bill, the inner webs of the innermost secondaries, and the hinder part of the abdomen, with the lower tail coverts, are pure white. It is an abundant summer bird in New South Wales and Van Diemen's Land, and its rapidity of flight, as might be expected from the great length of its wings, is so extraordinary, that as Mr. Gould remarks, it might be engaged in hawking for flies on the continent of Australia and on the island of Van Diemen's Land within half an hour. It flies in large flocks at a great height in the air, at least on the Australian continent, where the clear dry air causes the insects to rise to a great elevation; in Van Diemen's Land, on the contrary, where the air is moist, and the insects fly low, this Swift also skims along not far from the surface of the ground. The nidification of this bird is not known.

THE SHARP-TAILED SWIFT (*Acanthylis oxyura*) is an inhabitant of South America, especially of Paraguay, where, according to D'Azara, it is called by the Indians *Mbiyuimbopi*, or the *Bat-Swallow*, from a resemblance, both of its colour and mode of flight, to those of a bat. It flies principally above the highest trees of the woods of Paraguay, and when it passes to the open country rarely descends within thirty or forty feet of the earth, even then rising again speedily to its ordinary elevated position. It is a very shy bird. Like all the Swifts it drinks on the wing, flying rapidly over the surface of the water, and taking up a little sip in passing. It passes with great rapidity, but with the utmost precision, amongst the branches of trees, and when thus engaged often carries off spiders from the webs which they have spread there; and it is in the cavity of a hollow tree that it passes the night. In flying this bird produces a sound which is compared by D'Azara to that of a very small pair of castanets.

THE HOODED SWIFT (*Dendrochclidon comatus*). The genus, to which the name of *Dendrochelidon*, or *Tree-swallow*, has been applied, consists entirely of eastern species, peculiar to India and the islands of the Indian Archipelago. They have the hinder toe nonversatile, the tail forked, and the head usually adorned with an erectile crest or with tufts of feathers. The Hooded Swift, which is an inhabitant of the numerous islands of the Eastern Sea, is a beautiful little species, measuring only about five inches and a half in length; the general colour of the plumage is a bronze green; but on the head there are some long white feathers, which form a sort of hood or crest when erected. The belly and under tail-coverts are also white.

THE BEARDED SWIFT (*Dendrochelidon mystaceus*), which is found only in New Guinea, is another elegant species, the contrast of its colours producing a most pleasing effect. The colour of the crown of the head, of the wings, and tail, is blue-black; a portion of the wing-coverts and the outer web of the external tail feathers are white; a white band, originating at the nostrils, passes above each eye; and beneath the lower mandible there springs a tuft of small white feathers, which borders the gape, and terminates on the sides of the neck in two long slender white plumes, exactly resembling a white moustache of the true military cut. The other parts of the bird are of a brownish slate-colour, except the inferior tail-coverts, which are grey.

THE ESCULENT SWALLOW (*Collocalia esculenta*)—Plate 5, fig. 16—which we might with more propriety call the *Esculent Swift*, is one of the most remarkable birds of the whole tribe of the Fissirostres. This bird, with several others belonging to the same genus, is found in many parts of India, both on the continent and on the islands. Their nests, which are built in fissures and caverns of the rocks, are the celebrated edible birds' nests, so highly prized by the Chinese for the preparation of soups and sauces. The nests are composed almost entirely of the glutinous matter which in the other Swifts assists so materially in binding together the materials of which the nests are composed, and which, as we have previously stated, is secreted by the greatly-developed salivary glands. These, in the species of the genus *Collocalia*, or at all events in those which are regarded as the principal manufacturers of the edible nests, are of very large size. Although this view is now generally received, it was long a matter of considerable doubt amongst naturalists where and how the so-called Esculent Swallows obtained the materials of their nests, the most general opinion being that these were derived from sea-weeds picked up and eaten or masticated by the birds. Hence Thunberg described one of the species under the name of *Hirundo fuciphaga*. There is, however, still considerable doubt as to the number of species which make the edible nests. According to Linnæus, his *Hirundo esculenta* had white spots on all the tail feathers, a character which does not occur in any species known to modern naturalists. Thunberg describes his *Hirundo fuciphaga* as being of a black colour; ash colour, dull brown, or white beneath; and with the tail, wings, and feet entirely black. We have placed the name given by Linnæus at the head of this article, as it seems pretty certain that one of the species engaged in the production of the edible nests will be found to correspond with the description of the illustrious Swede; there being several concurrent testimonies in the works of the older travellers and naturalists, to the effect that the Esculent Swallow has white spots on the tail feathers. Should this prove correct, there will be at least three known species of these birds, namely—

Collocalia esculenta of Linnæus;
Collocalia fuciphaga of Thunberg (since described by Mr. G. R. Gray as *C. nidifica*, on the ground that Thunberg's name is erroneous); and
Collocalia Linchi of Horsfield and Moore, a species very nearly allied to *C. fuciphaga*.

Although, as already stated, Thunberg had adopted the notion that these Swifts procured the materials of their nests from the sea-weeds cast upon the shore by the waves, and other writers maintained a somewhat similar opinion, namely, that the glutinous matter was derived from the spawn of fishes or the bodies of mollusca, the Rev. J. Hooyman published in 1781 a paper, in which he completely disproves these views, and approaches very nearly to the true solution of the problem. He declares that the food of the birds consists of insects—a statement which has been confirmed by subsequent observations. He describes the habits of the birds as very similar to those of the other Swifts; they resort during the day to marshes, inland lakes, and plains, over which they hover in pursuit of the insects which abound in such situations; and it is difficult to suppose that those numerous individuals which inhabit the interior of such large islands as Java and Sumatra would undertake a journey to the sea-coast and back in search of the materials for their nests. Mr. Hooyman's idea of the mode in which the glutinous material of the nest is procured is, that it is elaborated from the food of the bird, by a peculiar organic effort resembling secretion. In this it will be seen that he was not far from the truth, for Sir Everard Home and Mr. Blyth both state, that the glutinous matter is undoubtedly a secretion from the enormously-developed salivary glands, and chemical analysis of the nests has confirmed this conclusion.

We have stated above that the *Collocaliæ* producing edible nests are found in great numbers both on the Indian continent and in the islands; but it is principally in Java that any information as to the natural history of the birds and the mode of collecting the nests has been obtained. This island appears to be peculiarly adapted for the dwelling-place of these birds, which congregate in large flocks in caverns and fissures of the rocks, and build their nests upon the walls of these. Both in the interior and on the coast extensive hollows are formed abundantly in the rocks, probably caused to a considerable extent by the volcanic action to which the island is so subject. Here the Swifts swarm in vast flocks, and the management of the nests, especially in the caverns of the southern shore of the island, is laid down by regulations established by the government. So well is this singular harvest regulated, and so well has experience taught its managers the conditions under which it is to be realized, that the average quantity of nests to be expected from each cave may be estimated before the season for gathering them, with remarkable accuracy.

The collection of the nests is undertaken in Java at three periods in the year. The principal harvest is gathered in the month of October, after the birds have been left undisturbed for about six months; the other two gatherings are in December and March, so that there are two intervals of three, and one of six months, between the gatherings. The shorter periods scarcely allow the birds time to build their nests and bring their progeny to maturity, so that both in December and March great numbers of young birds are necessarily destroyed; on the other hand, the nests obtained at these gatherings are of superior quality, clean and white, and very free from any extraneous matters. During the longer interval of six months the birds are enabled to rear two broods; thus the quantity of nests becomes very large, and the maintenance of a sufficient number of the birds is provided for. In collecting the nests, various contrivances in the shape of ladders and scaffolding are necessary; and notwithstanding these aids, the gatherers appear to be exposed to considerable risk.

The number of nests collected in Java is very great, the quantity passing annually through the market of Batavia on its way to China being estimated by both Raffles and Craufurd at two hundred peculs, or two hundred and fifty hundredweights; but this is nothing in comparison with the Sooloo Archipelago, which produces no less than five hundred and thirty peculs. The total value of the edible birds' nests imported into China is said to be 1,263,570 Spanish dollars, or £284,290 sterling. This, however, can give us but an imperfect clue to the actual quantity of this article of luxury which finds its way to the Chinese markets; the price paid for the nests varying greatly according to the quality of the different samples. Thus the best and purest sorts fetch 3500 Spanish dollars per pecul, or about £5 10s. per pound; the second quality will not bring more than 2800 dollars; and the third only fetches about 1600 dollars. These prices will give some notion of the way in which these birds' nests are prized in China, but they still only indicate the value at the place of importation. This value increases to a very considerable extent as the delicacies are conveyed away from the coast, and we are told that in some parts of China, a *catty*, or about one pound and a quarter of these nests, has fetched no less than 40 Spanish dollars, equivalent to £9 sterling.

Family III.—HIRUNDINIDÆ.

In this family, which includes the well-known species of true Swallows, we meet with characters very similar to those presented by the Swifts, which form the preceding family. The differential characters of these two groups were, to a certain extent, indicated under the head of the Cypselidæ, so that we need not dwell upon them here at any length. In their general form the Swallows closely resemble the Swifts, as they do also in their mode of life; but their wings are shorter and broader, their nostrils of small or moderate size, and the gape of the bill is surrounded by short bristles. The tail is more or less forked, and the feet are always of the ordinary structure, having three toes before and one behind. The difference in the structure of the sternum and trachea has already been alluded to.

The Swallows, like the Swifts and Goatsuckers, are all insectivorous birds which capture their prey on the wing, and those species which frequent cold and temperate countries are also birds of passage. Their appearance in the spring, and disappearance at the approach of winter, has been observed in Europe from time immemorial, and these birds have consequently been always regarded with a friendly eye by mankind, as serving in some sort as the harbingers of the summer. The habit of our common species of building about the habitations of man, and perhaps some indistinct notions of the benefits conferred upon us by these birds, by the destruction of immense numbers of insects —many of them injurious to us, directly or indirectly— have considerably increased this feeling. The ancients considered the Chimney Swallow to be under the direct protection of the household gods, and believed that when any injury was inflicted upon this familiar bird, it revenged itself by pecking the udders of the cows, causing them to become dry. The Ostiaks consider it a crime to kill swallows; and in most places it is looked upon as an act of inhospitality to kill or disturb these pleasing little strangers.

With regard to the nature of the retirement of these birds from their usual summer haunts, some very curious notions formerly prevailed, it being supposed by some naturalists that the Swallows concealed themselves in holes and similar places, where they slept during the winter; whilst others maintained a still more singular opinion, namely, that the birds passed the winter in the mud at the bottom of ponds and rivers. How this curious fancy could ever have been entertained it is difficult to conceive, but it was a very generally received opinion as late as the end of the last century. Nevertheless Frisch, a German naturalist, had long previously ascertained beyond doubt, by an ingenious experiment, that this notion could not be true. He attached to some swallows pieces of thread coloured with water colours, which would inevitably have been washed out had the birds passed the winter under water, in accordance with the popular opinion. The birds returned in the following spring with the thread still coloured— proving that they, at all events, had not been under water. These experiments, repeated by Spallanzani and others, served also to prove another singular fact, namely, that the Swallows generally return to the same spot and even to the same nest year after year. The actual migration of the Swallows has now been et beyond doubt by positive observations, made both on our own southern coast and on the northern shores of the Mediterranean; here they are seen taking their departure for the warm regions of Africa in the autumn, and also making their way back in the spring. In crossing the sea, they usually fly either singly or in small parties of two or three; and it is remarkable, that they arrive on the further side in a condition of exhaustion apparently as great as that of other birds of passage whose power of wing is far inferior. The channel fishermen state, that in hazy weather the Swallows very frequently alight in their boats when they are a little way out to sea, so completely fatigued, that it is with some difficulty that they muster strength to fly from one end of the boat to the other when an attempt is made to seize them. In fine calm weather they are often seen to descend upon the smooth surface of the water, with their wings widely extended, rising again after a short time, seemingly much refreshed by this partial bath.

Like the Swifts, the Swallows exhibit great activity on the wing, and in pursuit of the gnats, midges, and other insects, which constitute their sole prey, they perform numerous evolutions with much grace. They are very commonly seen hovering over the water, doubtless attracted by the many insects which swarm in such situations. They drink without alighting, by sweeping swiftly over the surface of the water and taking up a little of the fluid in their bills as they pass; they also occasionally bathe in the same way, by plunging a little deeper. Most of them breed twice in the season— sometimes nestling in holes, sometimes building a nest, usually composed wholly or in part of mud, against the cliff of a rock or the wall of a building. The species of this family are found in all parts of the world, but they are not very numerous. Three species occur in Britain.

THE CHIMNEY SWALLOW (*Hirundo rustica*)—Plate 5, fig. 13—is one of the British species. It is a small bird, for although it measures about eight inches and a half in length, the tail occupies nearly five inches of this, and thus the body of the bird is very small. The colour of all the upper parts, together with the upper part of the breast, is black, with violet tints; the forehead and throat are chestnut brown; the lower part of the breast and the abdomen are rusty red; and the inner webs of the tail feathers, except the two middle ones, are spotted with white. The outer tail feathers in the male are twice as long as the rest. They are rather shorter in the female; but in both sexes nearly the whole of the inner web of these feathers is white.

The Chimney Swallow is a very abundant bird in all parts of Europe during the summer, and in some parts of the Mediterranean district a few individuals even remain through the winter. But by far the greater part of our European swallows migrate in the autumn into Africa, where they pass the winter, and return to us in the spring. They arrive in this country early in April (about the 10th, as stated by Mr. Yarrell, from an average of many seasons), and take their departure again towards the end of October. From Europe the Swallow seems to extend its range eastward into Asia as far as Nepal and Calcutta, and probably still further, whilst in Africa it has been noticed certainly as far south as the equator; and in Sierra Leone it is said to reside all the year, although it becomes less plentiful in the rainy season, from June to September.

On its arrival in its summer quarters, the Swallow usually selects a spot for its place of abode, where the habitations of man lie in the vicinity of water; for, in common with a considerable majority of the members of this family, it has a great fondness for hovering over the surface of large ponds, lakes, and streams. The partiality exhibited for human habitations by this bird, as well as by many other species of the family, is very remarkable; and it is no less striking, that of the two familiar British species, one, the Swallow, frequents detached country places, villages, and farm-houses; whilst the other, the Martin, takes up its abode in towns. This may perhaps be, to a certain extent, accounted for by the fact, that the situation very commonly chosen by the Swallow for building its nest is the interior of a chimney, and the chimneys of old-fashioned houses in the country may be better adapted for this purpose than those to which we are accustomed in towns; but, whatever be the cause, the fact is quite certain, both as regards this and other countries, so that Linnæus denominated the two species *H. rustica* and *H. urbica*. Although the Chimney Swallow has received its most general name from the somewhat peculiar position in which it builds its nest, it by no means confines itself to a habitation of this nature, but builds readily in almost any suitable sheltered position. Thus the disused shafts of mines, and the sides of old wells, are sometimes resorted to by it; occasionally it will build in the roof of a barn or shed, attaching the nest to the rafters, or in a garret or passage to which it may find easy access. In almost all cases it selects a point where some projection from the wall or other sheltering body forms a buttress on which its nest may be supported. Some curious examples of the selection by these birds of rather anomalous places for their nests, are cited by Mr. Yarrell. He states that he had heard of the nest being built "in the half-open drawer of a small deal table in an unoccupied garret, to which access was obtained by a broken pane of glass." He mentions that he had in his collection a nest described by Pennant, built by a pair of swallows upon the body and wing of an owl which was nailed against a barn, and quotes from a provincial paper the following most singular instance of eccentricity on the part of a pair of these birds:—"A small steamer, the Clarence, lies at Annan Waterfoot, and plies between it and Port Carlisle, in the way of tugging vessels. A pair of swallows built their nest last year under the sponsons of one of the paddle-wheels, not more than three feet above the water, and succeeded in bringing forth their young. There they are this summer again (1845). During neap tides the Clarence plies every other day, and often every day. When she leaves the Waterfoot, the birds leave her and keep on the Scotch side; and when she returns, and is nearing Annan, the swallows invariably meet her, and accompany her to her berth."

The nest of the Swallow is built principally of mud or soft earth, collected in small pellets from the edges of ponds and other wet places. These are carried home in the bird's bill and plastered on to the spot selected for the nest; fresh pellets are then brought and added, together with numerous straws and leaves of grasses, and the whole is gradually moulded into the form of an open saucer, attached by one side to the wall of the chimney or other place of retreat. A lining of feathers is then put into the nest, and upon these the eggs are laid; they vary from four to six in number, and are of a white colour, speckled with ash grey and dark red. Two broods are reared in the course of the summer; of these the first is usually ready to fly by the end of June, and the second at the end of August. During the infancy of their offspring, the old birds are most assiduous in attending upon them, and have been observed to visit the nest about every three minutes throughout the day. When the young birds are nearly ready to fly, their parents still attend upon them, and gradually instruct them in the art of flying. Gilbert White says:—"The progressive method by which the young are introduced into life is very amusing. First, they emerge from the shaft, with difficulty enough, and often fall down into the rooms below; for a day or so they are fed on the chimney-top, and then are conducted to the dead leafless bough of some tree, where, sitting in a row, they are attended with great assiduity, and may then be called *perchers*. In a day or two more they become *flyers*, but are still unable to take their own food; therefore they play about near the place where the dams are hawking for flies; and when a mouthful is collected, at a certain signal given, the dam and the nestling advance, rising towards each other, and meeting at an angle—the young all the while uttering a little quick note of gratitude and complacency." This process of instruction may be constantly observed both with the Swallow and the Martin, and the curious way in which the young bird, when just ready to fly, may be seen apparently to hesitate about throwing itself off from its elevated position on the house or chimney top, and yet evidently most anxious to try the strength of its pinions, is very amusing. Notwithstanding their affection for their young, the Swallows, as well as the Martins, have been known to desert their second brood, when the young birds have been unable to fly at the period of the southern migration. When the young birds are able to fly, they roost in great flocks amongst the osiers and reeds in marshy places, and continue to do so until the time arrives for their departure for the South, and as they are fat and of good flavour at this time, they are captured in great quantities in some parts of Europe, by means of nets spread at night over their roosting-places.

The note of the male swallow is very sweet, and he sings both flying and perching. Both the swallow and the martin are exceedingly bold and courageous birds, and appear to be actuated by an intelligence which enables them to co-operate in anything which may tend to the common good. Thus, when a hawk makes its appearance in their vicinity, the swallow which first catches sight of this dangerous, or at all events suspicious intruder, immediately sounds a shrill alarm, when all the swallows and martins in the neighbourhood flock together to expel the common enemy, by pecking at him and annoying him in every possible way.

THE PANAYAN SWALLOW (*Hirundo panayana*). which is the most abundant and generally distributed of the Indian swallows, is also found in the countries beyond the Ganges as far east as China, and in the islands of the eastern seas, including even the Philippines. It is very closely allied to our Chimney Swallow, both in its appearance and general habits. It is during the winter months that these birds are most abundant in the peninsula of Hindostan, and probably in their other southern stations, and it is not known with certainty that they ever breed in Southern India. Mr. Jerdon notices that it disappears from some places during the hot season, and suggests that it may breed in the north of India, or spread still further over the Asiatic continent. It seems not improbable that both these suppositions may be correct; for, according to Captain Hutton, these birds breed freely at Candahar during the summer, building their nests in temples, open rooms, verandahs, and similar places. They seem to arrive at Candahar very early in the spring, as Captain Hutton says he has observed them there on the 5th of February, flying about with the thermometer at 36°. They leave the region of Candahar in October.

THE WIRE-TAILED SWALLOW (*Hirundo filifera*), another Indian species, distinguished from the preceding by having the extremity of the tail nearly even, with the two outer feathers very long and almost thread-like, is one of the most elegant of the Swallows. It is not common in the southern parts of the Indian peninsula, where it is always seen about water; but in the north it is very common, frequenting fields and gardens, as well as the vicinity of water. It usually flies in small parties of four or six, and builds a small saucer-like mud nest in holes of old walls and buildings, and on the sides of walls. Colonel Sykes describes this bird as presenting a very beautiful appearance when flying, with its thread-like tail feathers floating behind it.

THE CAPE SWALLOW (*Hirundo capensis*), which is a summer inhabitant of the Cape of Good Hope, and, indeed, of the southern part of the African continent generally, is another species very nearly allied to our Chimney Swallow, for which, indeed, it might easily be mistaken when flying. Like the common English Swallow, it is met with principally about inhabited places, and is so familiar as to enter the houses and build its nest against the walls and rafters. This proceeding is viewed with great satisfaction by the human inhabitants of the dwellings, who regard the swallows as birds of good omen. The nest is built with clay, worked in the same way as that of the Common Swallow, but the architectural powers of the South African bird are far greater than those of its European relation, for the nest, instead of being a mere cup, is closed on all sides, so as to form a hollow ball, to the interior of which access is obtained through a long tunnel. This cosy dwelling is lined with a profusion of the softest feathers.

THE AUSTRALIAN CHIMNEY SWALLOW (*Hirundo frontalis*), called the WELCOME SWALLOW (*H. neoxena*) by Mr. Gould, is a most beautiful representative of our Chimney Swallow at the very opposite side of the globe. Indeed this species was formerly supposed to be identical with the Panayan Swallow above referred to, and this again has been confounded with the Chimney Swallow of Europe, so that it will easily be seen that, notwithstanding its station at the antipodes, the Australian Swallow is very nearly related to our well-known little visitor. The plumage of the upper part of this bird is deep steel blue; the forehead, chin, throat, and upper part of the chest, rusty red; the remainder of the lower surface is nearly white: the wings and tail are brownish black, and all the feathers of the latter, except the two middle ones, have an oblique spot of white on the inner web.

Like our own swallows, this bird is migratory, passing the summer, and breeding in the southern parts of Australia and in Van Diemen's Land, but departing on the approach of winter to the more genial climates of the north. It arrives in New South Wales at the end of August or early in September, where it is welcomed by the colonists as the harbinger of spring; and one can easily understand that the sight of a creature so like a familiar friend of the old country, cannot but be pleasant to the eyes of those who are separated from the scenes of their youth by half the circumference of the globe. Hence Mr. Gould proposed to call it the Welcome Swallow.

The habits of the Australian Chimney Swallow agree very closely with those of our common species; like this it breeds twice in the season, and builds a nest of a cup-like form, composed of mud bound together with straws and grass. The interior of the cup is lined with fine grass, and finally with a layer of soft feathers, upon which four spotted eggs are laid. The natural breeding places of these birds are clefts and caverns in the rocks; but it is a remarkable circumstance that since the colonization of Australia by Europeans, the swallows have acquired the habit of associating themselves with man, building their nests about the sheds and outbuildings, and even evincing a decided liking for the chimneys.

THE TREE MARTIN (*Hirundo nigricans*), another Australian species, migrates like the preceding, and arrives in the southern colonies about the same time. It is also a familiar bird, taking up its abode in the towns without the least fear; but, unlike the preceding swallow, it builds no nest, but breeds in the holes of trees, where it lays its eggs on the soft dust usually met with in such places.

THE FAIRY MARTIN (*Hirundo ariel*) is a beautiful little Australian species, in which, as in the preceding, the tail is short, and rather notched than forked at the end. The Fairy Martin has the crown of the head red; the plumage of the back deep steel-blue; the rump and all the lower surface white or whitish. Each feather of the throat has a very fine brown line down its centre, so that this part has a delicately streaked appearance. This charming little martin arrives in the south of Australia in the month of August, and departs again to the northward in February or March; in the interval it produces from two to three broods. It is remarkable that, according to Mr. Gould's observations, this bird seems to bear an antipathy to the sea-coast. He says that he never heard of its being within twenty miles of the sea, although at that distance inland it was to be met with in profusion. In its habits it resembles our Martin, and when it builds about houses selects similar positions for its nest. The nest, however, is of a different form, being shaped somewhat like a bottle, attached by its bottom, with a more or less curved neck protruding horizontally.

THE AMERICAN BARN SWALLOW (*Hirundo erythrogaster*), one of the most abundant of the North American Swallows, was formerly supposed to be identical with our *chimney swallows*, although the differences even in the plumage, are quite sufficient to distinguish the two birds at first sight. The American bird is about seven inches in length, and thirteen in extent of wing; the whole of the upper parts are steel blue, as is also the breast; the forehead and the rest of the lower surface are chestnut-coloured, paler on the abdomen. The wings and tail are brownish black, with a slight greenish gloss; the tail is much forked, the outer feathers in the male being an inch and a half longer than any of the rest, and each feather of the tail, except the two middle ones, is marked with an oblong white spot.

This swallow makes its appearance in the United States in the month of March, and by the beginning of April is generally dispersed all over the country to the east of the Alleghanies, often ascending to a considerable elevation on high mountains. Like the European swallows, these birds have a predilection for the habitations of man, and, according to Wilson, they take up their abode in every barn to which they can have access. The feeling of the farmers is so strongly in their favour, that they are seldom molested, and Wilson mentions two superstitions which are entertained regarding them, and which must strongly conduce to their preservation. A German farmer assured him, "that if a man permitted the swallows to be shot, his cows would give bloody milk, and also that no barn where swallows frequented would ever be struck with lightning; and," says Wilson, "I nodded assent. When the tenets of superstition lean to the side of humanity, one can readily respect them."

The nest is not built until the beginning of May. It is of the form of an inverted cone, with one side cut off where it is applied against the rafter or other point of support; like the nests of the European swallows, it is composed of mud mixed with fine hay to bind it together. The conical hollow of the nest is stuffed with fine hay, upon the top of which a layer of downy feathers is placed, and upon this scientifically constructed bed the eggs are laid. These are usually five in number, of a white colour, speckled all over with reddish-brown. The birds generally have two broods in the season, and although twenty or thirty nests are often established in the same barn, and the nests are often placed close together, no squabbling takes place amongst the inmates. In the air this species has all the sprightly vivacity and agility of its congeners, and its song is a pleasing warble.

About the middle of September the barn swallows quit the United States, on their way to their winter quarters in the warm regions of the south. They take up their abode during the winter in the West Indian islands and in the tropical parts of the continent of South America; specimens in the British Museum are recorded from Nevis and Para.

THE SEVERN SWALLOW (*Hirundo bicolor*), another American species, the WHITE-BELLIED SWALLOW of Wilson, is less abundant than the preceding in the United States, and also considerably smaller. It measures less than six inches in length; the whole of the upper parts are light, glossy, greenish blue, with the wings and tail uniform brownish black; and the lower surface of the body is pure white. This species arrives in the United States a few days later than the preceding one, and takes its departure southwards a little earlier. It breeds in hollow trees, or in the boxes often put up for the accommodation of the Purple Martin; and, unlike most of the swallows, it uses no mud in the composition of its nest, which is formed of fine dry grass, with a thick lining of soft downy feathers. The eggs are four or five in number, and pure white. These birds are said to quarrel more in their flight than the Barn Swallow, and in the spring they are seen fighting in the air for a quarter of an hour together, keeping up a low chattering noise all the time. They frequent the same localities as the barn swallows, and like them feed on insects; but Wilson states that "for some time before their departure, they subsist principally on the myrtle berries (*Myrica cerifera*), and become extremely fat."

THE PURPLE MARTIN (*Progne purpurea*). Certain species of this family, all peculiar to America, are distinguished from the other swallows by a far more strongly developed bill, this being more than half as long as the head, and considerably compressed at the sides. The tail is slightly forked, and the tarsi, as in the preceding swallows, are scutellated, or covered with horny shields. The species presenting these characters form the genus *Progne*.

The Purple Martin is an abundant and well-known bird in the United States and in Canada, through which it continues its migrations as far as the Hudson's Bay territories; it reaches the southern states of the American Union as early as the end of February or the beginning of March, but occupies considerable time in its dispersion over the more northern parts of the continent. It does not reach its northern limit until the mouth of May. Wherever it appears, the Purple Martin is a great favourite with the inhabitants of the United States, many of whom even put up boxes, often containing a dozen or more compartments, to induce these birds to build about their houses; which, indeed, they are by no means loath to do; for, like almost all the swallows, they always seek the habitations of man. In return for this general favour, the swallows destroy vast quantities of insects, and according to some accounts, they also serve the purpose of an alarum, for, as day breaks, they commence an incessant musical chattering, which is said to be quite sufficient to awaken the most sleepy person. But a still more valuable quality possessed by the Purple Martin, is its inveterate hostility to all birds of prey, so that the vicinity of a colony of this species, is a most excellent protection to the poultry yard. "The Purple Martin," says Wilson, "like his half-cousin the King-bird (*Tyrannus intrepidus*), is the terror of crows, hawks, and eagles. These he attacks, whenever they make their appearance, and with such vigour and rapidity, that they instantly have recourse to flight. So well known is this to the lesser birds and to the domestic poultry, that, as soon as they hear the Martin's voice engaged in fight, all is alarm and consternation. To observe with what spirit and audacity this bird dives and sweeps upon and around the hawk or the eagle is astonishing." Under these circumstances, it is no wonder that the bird is a universal favourite, and Wilson gives us a ludicrous account of the only man he ever met with who disliked the martins. "This," he tells us, "was a penurious, close-fisted German, who hated them, because, as he said, 'they eat his *peas.*' I told him he must certainly be mistaken, as I never knew an instance of martins eating *peas;* but he replied with coolness, that he had many times seen them himself 'blaying near the hife, and going *schnip schnap*,' by which I understood that it was his *bees* that had been the sufferers; and the charge could not be denied." In fact, the Purple Martin has the somewhat singular taste of preferring wasps and bees for his food, and his diet is principally made up of these insects and large beetles. Of the latter, Wilson states that he has taken four from the stomach of a Purple Martin, all of them in a perfect state.

The Purple Martin is about eight inches in length, and the general colour of the plumage in the male is a deep, rich, purplish blue, with the exception of the wings and tail, which are brownish-black. The female is blackish-brown above, with a slight bluish or violet gloss; the chin and breast are greyish-brown, and the belly whitish. The birds begin to build about two days after their arrival, taking up their residence in any convenient cavity, frequently where no accommodation is specially prepared for them, taking possession of some of the compartments of a pigeon house. The nest, which is rather bulky, is composed of dry leaves, straws, hay, and feathers; the eggs are four in number, and pure white. There are two broods, of which the first (in the middle States) appears in May, and the second late in July. These birds by no means confine themselves to country places, but like the martins of our own country, come freely into the towns and cities, and sweep about boldly even in the most crowded streets. Their flight is exceedingly swift and easy, and they sail much with the wings expanded. They leave the United States for the South about the end of August. The Purple Martin has been recorded as a British bird, on the ground of several specimens having been killed at different times in this country; the most striking instance being that of two specimens shot at Kingsbury in Middlesex, in September, 1842; one of which was an old male, and the other a young bird of the year; hence, it would appear that the birds must have bred in this country.

Several other species of the genus *Progne* are found in the West Indian islands, and on the continent of South America; most of them have the same habit of building about the abodes of man; and one of them, which is common in the region of the Rio de Plata and Paraguay, has been described under the name of *Progne domestica.* They generally migrate southward in the summer, from the tropical into the more temperate parts of the South American continent, returning to the warm regions at the approach of cold weather.

THE SAND MARTIN (*Cotyle riparia*), a common British species, belongs to a group in which the feet are very slender and scutellated, the bill of moderate size, and slender, and the tail nearly even, or merely notched at the extremity. It is a very small species, measuring less than five inches in length; the upper parts are of a uniform light brown colour, with the quill feathers of the wings and tail very dark or blackish-brown; the lower surface is pure white, with the exception of a brown band, which crosses the upper part of the breast; the feet and bill are dark brown; the wings, when closed, reach a little beyond the end of the tail.

The Sand Martin, or Bank Martin as it is sometimes called, is very generally distributed over the British islands, but is still rather a local bird, and by no means so abundant as the chimney swallow, or the house martin. It arrives in this country rather earlier than either of those species, having been noticed once or twice before the end of the month of March. It is well known in all parts of Europe, ranging as far north as Norway and Sweden; in Asia, it is met with in summer in the more temperate parts of Siberia, and it also occurs in India and even in the Philippine Islands, whilst the European specimens retire into Africa like our other swallows. But this species is more cosmopolite than any of the preceding, for it inhabits both hemispheres, migrating from central and tropical America, to the northward, as far even as the 68th degree of latitude. Wherever it occurs, its habits are the same; it frequents the banks of rivers, the sides of sand-pits, and similar places, where a perpendicular bank of soft earth affords it the opportunity of burrowing without much difficulty. In these situations it scoops out the earth to a depth of about two feet in a horizontal direction, forming a beautifully regular cylindrical tunnel—a labour which, considering that its bill and feet are the only tools which it has to work with, is certainly most surprising. In its mining operations, the bird clings with its feet to the surface of the sand or earth, in every possible position, and uses its little bill as a pickaxe in digging, as vigorously as the most experienced navigator. The inner extremity of the burrow is usually more or less crooked, and here a bed is prepared for the reception of the eggs, by the accumulation of a little loose hay and a few soft feathers. In a suitable situation, great numbers of these little galleries are excavated side by side, and the birds may be seen constantly going in and out of the holes. The eggs are from four to six in number, and pure white. The habits of the Sand Martin, in all other respects, are similar to those of the swallows in general; like the preceding species these birds skim through the air with great ease and celerity, in pursuit of the insects on which they and their young are fed; and like them they are fond of the neighbourhood of water, into which they dip when on the wing, both to drink and wash themselves. According to White, the young are sometimes fed with dragon flies almost as long as themselves, and on leaving the nest they are to be seen perched in a row upon a rail.

THE CRAG SWALLOW (*Cotyle rupestris*), which is nearly allied to our sand martin, is an inhabitant of the southern parts of Europe and Asia, and of the north of Africa; its migrations being less extensive than those of the English species. The general colour of its plumage is ash-grey above and whitish beneath. In its habits it exhibits none of that engineering skill which is possessed by the sand martin, but builds a mud nest, lined with fine straw and feathers, amongst the clefts of the rocks, where it always takes up its habitation. It flies more slowly than the other swallows, but rises to a great height in the air; its home being amongst the mountains, it is rarely seen in the plains, except when stormy weather in the upper regions drives it to seek its insect prey near the surface of the earth. The eggs, which are of a pure white colour, are five or six in number. This species is the earliest visitor to the south of Europe of all the swallows, and is also the last to take its departure.

THE AFRICAN HOUSE MARTIN (*Cotyle fuligula*) differs from both the preceding species in building its mud nest under the eaves of houses; the nest is of a cup-like form. This species is found from Abyssinia to the Cape of Good Hope.

THE SMALL SAND MARTIN (*Cotyle sinensis*), and the **BROWN SAND MARTIN** (*C. concolor*), are eastern species, of which the former burrows into banks in the same way as our British species, whilst the latter builds its nest about houses, high walls, and other buildings. Both these species are found in India, but they do not appear to be very numerous.

THE HOUSE MARTIN (*Chelidon urbica*)—Plate 5, fig. 14—is distinguished from all the other species of the present family by having the feet clothed with very small feathers, instead of shields or scales. It is a small bird, measuring less than five inches and a half in length; the plumage of the upper parts is of a rich, glossy bluish-black colour, except on the rump, which is white; the whole lower surface of the body is pure white, and the quill feathers of the wings and tail are black. The wings are long and pointed, reaching quite to the extremity of the tail, which is moderately forked.

The House Martin is a common summer visitor to all parts of Europe, extending its migrations even as far north as Lapland and Iceland. In Asia it is common in Siberia. The European martins migrate southwards into Africa like the swallow, and their times of arrival and departure seem nearly to coincide with those of that species. In fact, the martins and swallows are said to leave the African shores at the same time; but as the latter possess rather greater powers of wing, they leave the martins behind them, and arrive in their European homes a few days earlier. The martins appear to have some sort of instinctive consciousness of their inferiority in power of flight, for they depart from our shores on their return journey, a few days sooner than the swallows, and thus both will probably arrive in their winter quarters about the same time.

In their general habits, in their mode of life, and their fondness for building about the habitations of men, the martins exactly resemble the swallows, and they share with them in the favour which seems to be universally regarded as their due, both from the familiarity of their habits, and their character as the harbingers of summer. Like the swallows they pass nearly all their time on the wing in pursuit of insects; they are also very fond of the vicinity of water, over which they may constantly be seen skimming, now sweeping about in wide circles, now flying straight along, with their wings nearly touching the surface, and dipping their little beaks into the fluid, for the purpose of drinking. Like the preceding species also, they are found to return with great constancy to their former places of abode, and to make use of the same nest for several years together.

The House Martin, as well as several other members of this family, nourishes a most inveterate enmity to all birds of prey, which he endeavours to drive away from his haunts. In this object all the individuals of this species inhabiting a locality will co-operate, and on other occasions they seem to have some sort of intelligence with each other, which enables them to combine their efforts to effect some desired purpose. An interesting example of this is related by Dupont de Nemours. He says—"I once saw a martin which had unfortunately, I know not how, caught its foot in the running knot of a thread, the other end of which was attached to a gutter of the Collége des Quatre Nations. Its strength being exhausted, it hung and cried at the end of the thread, which it raised sometimes by trying to fly away. All the martins of the great basin between the bridge of the Tuilleries and the Pont Neuf, and perhaps from a still greater distance, collected to the number of several thousands. They formed a cloud, all emitting cries of alarm and pity. After much hesitation, and a tumultuous consultation, one of them invented a mode of delivering their companion, made the others understand it, and commenced its execution. All those that were within reach came in turn, as if running at the ring, and gave a peck to the thread in passing. These blows, all directed upon the same point, succeeded each other every second, or even still more frequently. Half an hour of this work was sufficient to cut through the thread, and set the captive at liberty."

The House Martin, as already stated, generally takes up its abode in towns, and builds its nest under the cornices and eaves of houses, in the upper angles of windows, and similar situations. From its partiality for windows, it is often known as the *Window Swallow.* The nest is composed of mud or wet clay, collected by the birds in pellets, and brought up to the place selected for the nest in their bills. According to M. Vieillot, they frequently make use of worm-casts in their little edifices. The building is carried on with great care and deliberation, only a single layer of earth being applied in the day; this is left to harden before any more materials are brought. Gradually, by the addition of course after course of mortar, the nest acquires its well-known, nearly hemispherical shape, the only means of ingress and egress being a small round aperture at the top. The interior is then lined with a little hay and a few feathers, and the nest is ready for the reception of the eggs. These are four or five in number, and of a pure white colour. They are hatched in less than a fortnight, and as soon as the young are ready to leave the nest, the female lays again, thus producing three, and sometimes four broods in a season. The last brood is sometimes hatched so late in the season, that the period of migration arrives before the young are able to fly, and in this case the parents have been observed to leave their progeny to perish by starvation.

Occasionally, the sparrows, which take advantage of every cavity about our houses for their own purposes, finding the nest of a martin ready for use, take possession of it without ceremony; in this case the rightful owners endeavour, generally with success, to oust the intruder from their domicile. Sometimes, however, the sparrow in possession obstinately refuses to quit his usurped abode, and then the martins have been seen to adopt a very curious mode of revenging themselves, which we may describe here, as it also furnishes another example of a community of action in these birds. When the owners of the nest find that all their endeavours are insufficient to turn out the robber, they collect their friends and neighbours in great numbers, and watch the moment when the sparrow is engaged in the business of incubation; then, the whole body, each bearing a mass of soft earth in its bill, rushes at once to the nest, and in a few moments the aperture at the top is closed by a solid mass of mud, which no efforts on the part of the unhappy prisoner can possibly break through. So determined are they, indeed, to effect their object thoroughly, that, in a case recorded by the Vicomte de Tarragon, the mass of clay stuffed into the aperture was "nearly of the form and size of a small hen's egg, the two ends projecting into and out of the nest." The sparrow was found dead upon her eggs.

About the end of September, or the beginning of October, in this country, the martins collect in flocks, preparatory to their departure for their winter quarters. They assemble on the house-tops, and sweep about in the streets, even of large towns, in such a manner as must attract the attention of the most unobservant passengers. About the middle of October they leave this country; but individuals, and even small flocks, are sometimes seen at a much later period. The latest on record, is that of a martin seen at Sidmouth in Devonshire, by the Rev. W. F. Cornish, on the 10th December, 1835.

FAMILY IV.—CORACIADÆ.

With the present family we commence the series of groups, which, although united with the Fissirostres by all modern ornithologists, present so many differences from the birds forming the preceding three families, that we may regard them as constituting a distinct section of the fissirostral tribe. In the majority of these birds, as we have already stated, the outer toe is united to the middle one for the greater part of its length, a character belonging to the group denominated by Cuvier *Syndactyli*.

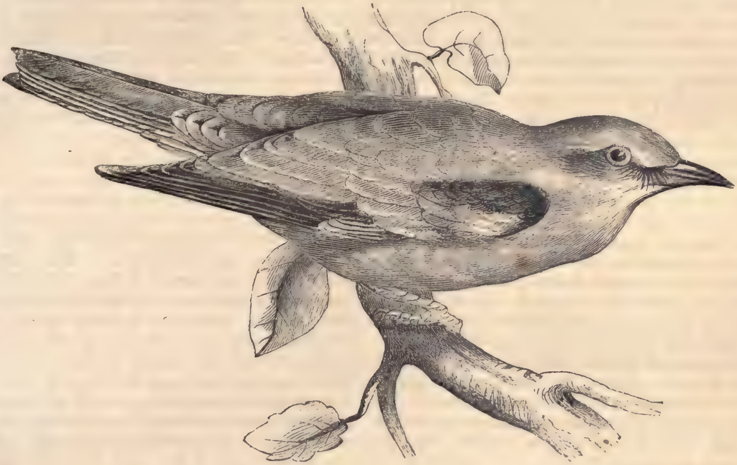
This syndactylous character of the feet does not, however, occur in perfection in the first family of this section, that of the *Coraciadæ* or *Rollers;* in these birds the outer toe is sometimes free, and sometimes united to the middle one only at the base, in the same way as in a great number of other birds. The species of this family present a considerable resemblance to some other forms placed in the conirostral and dentirostral sections of the Passeres. In fact, in the form of the body, the gait, and to a certain extent in manners, they are so like some members of the corvine family, that they were placed in juxtaposition with them by the older writers. They possess an elongated bill, which is usually broad and depressed at the base, and compressed at the sides towards the tip, which is often slightly hooked. The gape is wide, reaching back generally as far as the eyes; it is bordered at the base of the upper mandible by a row of bristles.

The birds of this family are often distinguished by great beauty of plumage. They are for the most part confined to hot countries, a few only being inhabitants of the more temperate regions. Their food consists principally of insects, but some of them are found to subsist also wholly or in part upon vegetable substances. We have only a single British species, namely—

THE COMMON ROLLER (*Coracias garrula*), an inhabitant of the African continent, from which, however, it migrates freely in the summer into Europe, but is only a rare and occasional visitor to this country (fig. 105). In the south and east of Europe, and even in the great forests of Germany, it is, however, not uncommon, but in Asia it seems only to occur in the parts bordering on Europe, namely, in Asia Minor, and the countries between the Black Sea and the Caspian. On the steppes of Southern Russia it is abundant, and goes by the name of the *Steppe Parrot*, a name given to it, no doubt, partly on account of its squalling voice, and partly from its beautiful plumage. In the latter respect, it is indeed one of the most brilliant of European birds. The head, neck, and wing coverts are of a beautiful, rich greenish-blue colour; the shoulders, rump, and tail-coverts are blue; the back, scapularies, and tertials are yellowish-brown; the wing primaries and secondaries are of a fine verditer blue at the base, with the rest blue-black; the two middle feathers of the tail are blackish-green, the remainder bluish-green, the outer feathers on each side being tipped with black; the whole lower surface of the body is pale bluish-green, with the throat verditer blue, and the lower surface of the quill feathers, both of the wings and tail, is rich blue. The feet are yellowish-brown; the bill and claws black. In the male the outer tail feathers are slightly elongated. The whole length of the bird is about thirteen inches.

The foregoing description will give but a very imperfect notion of this beautiful bird, which is described by one observer as looking "like a moving rainbow," when flying in the sun. It passes the winter in Africa, and probably the majority of the individuals of this species dwell throughout the year on that continent, for it does not appear that the northern migration is by any means universal. It is not only common in the islands of the Mediterranean, in passing to and from its winter quarters, when it is so abundant, especially in Malta, that it is captured in great quantities, but also stays in those localities throughout the summer, and breeds there. In central Europe it usually inhabits the dense forests, where it builds its nest in the holes of trees, generally preferring the birch for this purpose, whence it is known in Germany as the Birch-jay. In those places where trees are scarce, as in Malta, the Roller is said to breed upon the ground, or in the holes of old buildings; and in the treeless regions of Southern Russia, it makes its nest in holes of the clay-banks of the rivers. This habit is exactly similar to that of the Kingfishers and Bee-eaters, which are now associated with the Rollers in the tribe of the Fissirostres, and thus furnishes an additional bond of union between these groups of birds, which is further strengthened by the fact, that the eggs of the Roller, which are usually four in number, are exactly similar in shape and in their pure white colour, to those of our common Kingfisher and Bee-eater. It is a noisy and restless bird, a circumstance which has doubtless had much to do with the popular notion by which the Roller is associated with the Pies, and especially with the Jay. This, and its brilliant colouring, has also given rise to a comparison of this bird with the Parrots —it is not only called the Steppe-Parrot in Russia, but is also known as the *German Parrot*, in more western countries of Europe. In the autumn the young birds become very fat, and acquire a good flavour, when they are eagerly sought after in Greece and elsewhere, as a choice article of food.

Fig. 105.



The Common Roller (Coracias garrula).

THE INDIAN ROLLER (*Coracias indica*) is an abundant species in most parts of India, where it is regarded by the Hindoos as sacred, from a belief that the god Siva once assumed its form. It is a bird of brilliant plumage, green and blue being the prevailing colours; the throat and breast are reddish. The length is about thirteen inches. It inhabits the groves of trees about the villages, and also the jungle, and flies buoyantly, but with a constant flapping of the wings. In its habits it is rather shy, flying off at the approach of a man; but towards its feathered neighbours it exhibits considerable pugnacity of disposition, driving off the crows from its vicinity with great ease. Its food consists principally of large insects, such as grasshoppers, caterpillars, and mole-crickets, but it is said also to feed on miçe. The nest is rather large, but loosely put together, built of twigs, and lined with grasses; it is generally placed near the summit of a middle-sized tree growing in the vicinity of water. The eggs are four or five in number, and of a deep blue colour.

THE LONG-TAILED ROLLER (*Coracias caudata*) is of larger size than the preceding species, measuring from sixteen to seventeen inches in length; it has the back orange-brown; the lower surface of the body, the head, the neck, and the wing-coverts, sea-green; the forehead, a streak over each eye, and the chin white; the quill feathers of the wings blue, those of the tail greenish, the two middle ones being greenish-black, and the two outer ones, which are a good deal longer than the rest, crossed by a band of blue and black towards the tip. This handsome bird is abundant in Africa, where it appears to migrate southwards in the summer from the tropics, towards the Cape of Good Hope. Its habits are not well known, but according to Le Vaillant it lives in the woods, and feeds both upon fruits and insects. In the north of Africa it is said to breed in holes in the banks of rivers, and also in the crevices of rocks, old buildings, and similar situations.

THE JAVANESE TODY (*Eurylaimus javanicus*)—Plate 6, fig. 19—is an example of a remarkable group of birds belonging to this family, all of which are found only in India, and the neighbouring islands. The Javanese Tody, which was discovered by Dr. Horsfield in the island whose name it bears, has the head and neck above chestnut-brown; the back black, with a yellow stripe down its centre, becoming expanded into a large spot on the upper tail-coverts; the wings are black, edged with yellow from the wrist downwards, and with a yellow mark on the outer web of each secondary feather; the whole forming a broad yellow band near the apex of the wing when closed. The scapularies, which are elongated, are also yellow; the feathers of the tail are black, with a white spot near the tip of each, except the two middle ones; the lower surface is wine-red, purplish on the throat, below which is a narrow black transverse line, followed by an olive band of a somewhat crescent shape. The bill is very broad, strong, hooked at the tip, and greenish-blue. The whole length of the bird is about nine inches.

Nothing is known of the habits of this bird. Dr. Horsfield simply says of it—"I discovered this species in one of the most distant and inaccessible parts of Java, covered with extensive forests, and abounding with rivers and marshes." From the shortness of its wings, it is probably only adapted for short flights amongst the branches of the trees, in pursuit of caterpillars and other sluggish insects. It is found not only in Java, but also in the Malayan peninsula as far as Tenasserim, and in the great island of Borneo.

THE FRILLED INDIAN TODY (*Serilophus lunatus*), which is nearly allied to the preceding, has hitherto only been met with in the Tenasserim provinces. It is about eight inches in length; the plumage of the head and back is of different shades of brown, becoming rich chestnut towards the rump; the head is adorned with a crest, and marked with a black line running up from the base of the bill over the eye to the nape; the lower surface is of a delicate grey, and on each side of the neck is a beautiful crescent-shaped mark, composed of silvery white feathers. The wings are black, with a large blue patch or broad band across the middle; the tail is also black, with the three outer feathers on each side tipped with white; the bill is greenish-blue.

This beautiful little bird is found in the thickest jungles, and according to Major Godfrey, "its food was found, upon minute investigation, to consist entirely of berries and fruits." Dr. Helfer once observed them in societies of thirty or forty sitting on the loftiest trees in the forest; he says they were so fearless that the whole flock might be shot one after the other.

THE GREAT-BILLED INDIAN TODY (*Cymbirhynchus macrorhynchus*). This remarkable bird, which is also a near relative of the preceding, is met with from the Tenasserim provinces and Malacca to the island of Sumatra. The plumage of the head, back, wings, and tail, together with the chin, and a band round the throat, is black; the rump and the whole lower surface of the body deep crimson; the three outer tail feathers on each side are spotted with white, and the scapularies, which are very long and slender, are also white. The bill, which is very broad and stout, is of a beautiful blue colour. The length of the bird is about ten inches.

This beautiful bird frequents the banks of rivers and lakes, and other marshy and watery situations, where it finds an abundance of the insects and worms which constitute its food. It builds a nearly globular pendent nest, composed of small twigs, which it attaches to the branches of trees growing out of the water. The eggs are four in number, and of a pale blue colour, without spots.

THE GREEN TODY (*Todus viridis*). The Rollers are represented in America by two small groups of birds to which the names of *Todies* and *Motmots* have been given. The Todies are distinguished by having an elongated bill, which is exceedingly broad and depressed towards the base, so that it acquires a tongue-like shape. The margins of both mandibles are finely denticulated. The outer toe is nearly as long as the middle one, to which it is united for three-fourths of its length; the inner toe, which is considerably shorter, is also united to the middle one for half its length. Of these birds only four species are known; they are all inhabitants of tropical America and the West Indies.

We have cited the Green Tody as being the best known species; indeed, until a comparatively recent period, the others were often confounded with it. The Green Tody is a very small bird, being little bigger than a wren; the whole upper surface is of a vivid green colour; the throat is brilliant crimson, and the remainder of the plumage of the lower surface white. This bird is exceedingly common in all parts of Jamaica, which appears to be its head-quarters; it feeds exclusively upon insects, which it usually captures while hopping about upon the twigs of trees. It is bold, allowing a person to approach it very closely, and if disturbed usually flies off to another twig only a few yards distant. Its brilliant green plumage, and crimson throat, render it the admiration of all visitors to Jamaica. The nest is formed in a burrow excavated in a dry bank, to a depth of about a foot, entirely by the agency of the bird's bill and feet; its course is somewhat tortuous, and at its extremity is a large chamber, which the bird lines with the dry fibres of plants, moss, and cotton, for the reception of its eggs. The latter are four or five in number, of a grey colour spotted with brown.

THE BRAZILIAN MOTMOT (*Momotus brasiliensis*). The Motmots are considerably more numerous than the Todies, in conjunction with which they represent the Roller family in South America and its islands. They are distinguished by having the margins of the mandibles, which are much stronger than in the Todies, distinctly notched or serrated for a considerable portion of their length. They also possess a pectinated tongue. The tail in these birds is long, and the feathers gradually increase towards the middle; but it is remarkable that in nearly all specimens the shafts of the two middle (longest) feathers are entirely bare of barbs for a considerable portion of their apical half—the base is furnished with barbs, then follows the bare portion, and the tip again presents the ordinary appearance of a feather. It is supposed that the birds must pick off the barbs of this portion of the tail feathers. The name of *Motmot* is said to be derived from the peculiar note of these birds, which is described as resembling those syllables slowly repeated. According to other writers, however, the cry of the Motmot is comparable to the syllables *toutou*. The Brazilian Motmot, which is not uncommon in several districts of the tropical parts of South America, is about the size of our common blackbird; its general colour is green, but the face, and a spot in the middle of the breast, are black, and the head is blue.

Little is known of the habits of these birds, as they are solitary in their disposition, residing, usually in pairs, in the deepest recesses of the forests. They feed principally upon insects, which they capture by pouncing down upon them suddenly. Besides insects, however, they are said occasionally to devour small snakes and lizards, and even small birds, and sometimes to feed upon fruits. They are said by some writers to nestle in the holes of trees, by others to burrow in the ground; if the latter be true, the barbs of the long tail feathers might possibly be worn away by friction against the sides of their narrow tunnel.

FAMILY IV.—TROGONIDÆ.

The Trogonidæ, or Couroucous, as they are sometimes called, from the name given by the natives of South America to some of the species inhabiting that continent, and which is said to be an exact imitation of their cry, are distinguished from the preceding families, by having the toes of unequal length, and arranged, as in the scansorial birds, in two pairs. They have a stout bill, broader than high, so that it presents a triangular form when seen from above; the edges of the mandibles are sometimes strongly serrated, sometimes smooth nearly to the tip, and there furnished with a single tooth.

The Trogonidæ are all inhabitants of tropical regions, and the majority of them belong to the New World, although several species, distinguished by peculiar characters, are found in India and the Eastern islands. One species, also, scarcely distinguishable generically from the American forms, is an inhabitant of Southern Africa. They are usually adorned with brilliant metallic colours, inhabit the thickest parts of the forests, and feed principally upon insects, which they frequently capture on the wing. Some of the species also eat fruits.

THE COUROUCOU (*Trogon Curucui*), an abundant species in Guiana and Brazil, measures ten or eleven inches in length, and is generally of a fine brilliant green colour, with the breast and belly of a beautiful red; the wing-coverts are bluish-grey, marked with undulated black lines; the tail, which is wedge-shaped, is green, except the two outer feathers on each side, which are blackish, crossed with small grey transverse lines.

The name of this bird is derived, as previously indicated, from its peculiar melancholy note, which is described by different authors as resembling the word *couroucouais* so exactly, that, whilst the natives of Brazil give it this name, the Indians of Guiana merely drop the *c*, and call the bird *Ouroucouais*. The Couroucou is found in the deepest recesses of the forests, especially at the breeding season, when the male employs the above-mentioned melancholy note to express his feelings towards his mate. In April, when the breeding season commences, the birds seek out a suitable hole in a tree, which they adapt to their purpose, by means of their bills, lining the bottom of the cavity with the powdered rotten wood which they disengage from the sides. Upon the bed thus formed, the female lays three or four eggs about the size of those of a pigeon. Whilst the female is sitting, the male perches on a branch close at hand, and continually emits his tender cooing notes. At other times the male is silent, and both sexes frequently perch for a long time, perfectly motionless upon a branch, and puff out the long loose feathers with which their bodies are clothed to such an extent, that while their bulk is scarcely greater than that of a thrush, they look as large as a pigeon. They feed upon worms, insects, and caterpillars.

THE CUBA TROGON (*Trogon temnurus*), which is of about the same size as the preceding species, has the crown of the head of a violet-blue colour, the upper surface of the body brilliant metallic-green, the throat and breast greyish-white, and the belly vermillion. The scapulars and the great coverts of the wings are green, with a white spot near the extremity of each feather; the quill feathers of the wings are black, adorned with white spots, and those of the tail green or blue, spotted with white. This bird is chiefly remarkable for the peculiar form of the tail, each feather of which is truncated at the extremity, with its exterior angle produced outwards, so that, as the general form of the tail is, or rather would be, wedge-shaped, its whole apical half is surrounded by a series of points. It is a beautiful species, which has only hitherto been found in Cuba, where it is very common in the woods. Its note, which is heard in the morning and evening, is described as resembling the syllables *tocorr*. This species is said to feed upon vegetable substances. It sits in a very passive state upon the branches, so that it is easily killed; and great numbers are destroyed for the table, their flesh being very good.

THE RESPLENDENT TROGON (*Trogon resplendens*) —Plate 7, fig. 20—which has been placed by many authors with several nearly allied species in a distinct genus, to which the name of *Calurus* is given, is distinguished from the preceding species, partly by the presence of a large crest of delicate feathers on the head, and partly by the great development of the upper tail-coverts, which conceal the tail, and hang down in the form of long delicate plumes of great elegance.

The male of this Trogon is one of the most magnificent of birds. The head and throat are of a golden bronze colour; the neck and breast, the back, and the wing and tail-coverts, are of the most brilliant golden green; the wings themselves are black, or blackish, setting off the splendour of the wing-coverts in the most striking manner; whilst the whole of the belly and the lower tail-coverts are of a beautiful crimson tint. The feathers of the tail are black. Of the elongated tail-coverts, the two middle ones are the longest, but the whole are most delicate and beautiful, being composed of long loose barbs, gradually diminishing to the apex of the feather, and hanging in the most graceful manner. The species is found in Brazil and Peru, where it is employed by the natives as an ornament; the Peruvian ladies being especially fond of adorning themselves with tufts of the long and brilliant tail-coverts. The tenderness of the skin, and the ease with which the feathers are detached, render the skinning of these birds a very difficult operation, and this applies to the whole of the Trogons. Most of the specimens obtained from the Indians of America are simply dried without skinning. Several other species of Trogons, scarcely yielding to the preceding in beauty, are found in the tropical parts of America; but to these our space prevents our alluding. We shall therefore pass to—

THE NARINA TROGON (*Apaloderma narina*), the only African species. This bird approaches very closely in its general characters to its American relations, differing only in some particulars of little importance. Like them it displays a brilliant lustre on its green plumage, which is replaced by a deep rose tint on the lower parts of the body. The greater wing-coverts are grey, with fine black lines and dots; the wings are black. The four middle feathers of the tail are of a fine golden green colour, and of equal length; the three outer feathers on each side become rapidly shorter, so that the outermost is only about half the length of its next neighbour; these feathers are white, with black bases. The whole length of the bird is about fourteen inches.

This species is an inhabitant of the southern part of the African continent. It nestles in the hole of a tree, where it lays four eggs of a delicate pale rose colour, which are remarkable for their transparency and extreme fragility. During the breeding season the male emits sounds of the most melancholy nature; at other times he is very silent.

THE FASCIATED TROGON (*Harpactes fasciatus*). The Indian species of the family Trogonidæ are distinguished from all the preceding forms by the want of serratures on the margins of the mandibles, these being smooth nearly to the tip, where they exhibit a notch, or tooth, somewhat similar to that occurring in many dentirostral birds. Nearly a dozen species have been met with in different parts of India and the islands of the Eastern archipelago.

The Fasciated Trogon, which is an inhabitant of the Indian peninsula and of Ceylon, is a fine and striking species, about ten inches in length; its colour is ferruginous above, tawny red beneath; its wing-coverts are barred with black and white; its head and neck are black, with a naked blue patch surrounding the eyes; its breast has a band of white, its tail-coverts are grey, and the quill feathers of its wings and tail dusky; the latter tipped with black.

This bird occurs in the dense jungle amongst lofty trees, where it is generally seen seated motionless upon a branch, occasionally flying off in pursuit of some passing insect. More than two are rarely seen together.

HODGSON'S TROGON (*Harpactes erythrocephalus*), an inhabitant of the elevated regions of Northern India, and of Tenasserim, is said by Captain Tickell to fly in small troops, and to be active and vociferous in the morning, a behaviour which indicates more sociability of character than is usually attributed to the Trogons. Captain Tickell states, however, that in the heat of the day this species takes up a position in the shade, and sits there solitary and quiet, so that it is possible the other species have similar habits. We need not refer to the other species, of the habits of which little is known.

FAMILY V.—ALCEDINIDÆ.

This family, which includes the well-known *Kingfishers*, and a great number of nearly allied forms, is characterized by the form of the bill—which is elongated, generally quite straight, stout, broad at the base, and acute at the tip—by the small size of the tail, and the shortness of the tarsi. The toes are variable, both in number and arrangement; sometimes they are placed in pairs, as in the preceding family; sometimes three in front and one behind, as in birds in general; whilst in some cases, one toe is altogether deficient, and the foot has two toes in front and one behind. The wings are long and rounded, and the birds possess considerable powers of flight.

Their food consists of animal matters; some, like our common kingfisher, capturing fish with great dexterity; whilst others feed more upon insects, or upon these and small reptiles, or other terrestrial creatures. In other respects, they exhibit a great variety of habit, and they occur in almost all parts of the world, although most numerous in warm countries.

THE COMMON KINGFISHER (*Alcedo ispida*)—Plate 7, fig. 21—the only European representative of the family, is one of the most beautiful of British birds; its appearance, as it dashes along in the sun, giving one the idea of a living emerald. The top of the head, the wing-coverts, and a stripe on each side of the neck, are green, covered with most beautiful azure spots; the back is dark green, with its hinder part and the rump azure; the throat, and a streak on each side of the neck, are yellowish-white, and all the rest of the lower surface of the body is pale chestnut. The quill feathers of the wings are greenish-black, and those of the tail deep blue. The beak, which is an inch and a half long, is black, with the base of the lower mandible orange. The feet are of a reddish-brown colour; they have three toes in front and one behind, and the outer front toe is united to the middle one, as far as the second joint.

The Kingfisher is an inhabitant of all parts of Europe, except in the extreme north; thus it occurs, although rarely, in Denmark, but does not appear to inhabit the Scandinavian peninsula. It is also met with in the temperate parts of Siberia, and extends thence to the southern parts of Asia, whilst in Africa it occurs as far south as the Senegal. It is always found in the vicinity of water, frequenting the banks of rivers and brooks, and also of large ponds, over the surface of which it may be seen shooting along rapidly, like a little green meteor. Its food consists not only of small fishes, but also of aquatic insects and leeches, and probably any other production of its favourite element will hardly come amiss. When watching for food, the Kingfisher takes his post on a bush or tree overhanging the water, or on a rail by the bank side, and here he waits patiently until his expected prey comes within sight; then he dashes instantly down upon it, and so rapid are his movements, and so unerring his aim, that he rarely fails in his attack. Sometimes he is seen to hover over a particular point of the surface of the water, waiting for the favourable moment to make his plunge; but when the prey is caught, he always makes his way back to his post of observation, and then swallows his victim head-foremost, usually crushing it first, to prevent struggles during this operation. Although so strictly aquatic in its habits, the Kingfisher remains in this country throughout the year, but in severe weather it has been known to quit the inland fresh waters, and to resort to the sea-shore.

The Kingfisher is a solitary and pugnacious bird, living in pairs during the breeding season, but rarely allowing any neighbours of its own species. It dwells in holes in the banks of the streams which it frequents, and these are said to be usually the deserted burrows of the water rat, or of other Mammals. Whether the Kingfisher ever digs its own burrow is still uncertain; but it would appear not improbable that it may do so occasionally; and on taking possession of the deserted domicile of some other animal, it seems always to make some alterations to suit its abode to its own purposes. The floor of this retreat is always covered with the disgorged bones of the small fishes devoured by the birds, and it is upon these that the eggs are laid. The eggs are of a pinkish tint, and vary between five and seven in number. When the young are hatched, the parents feed them by disgorging the fishes and other animals which they have captured; and they continue to supply the wants of their offspring in the same manner for some time after they are able to leave the nest. The note of the Kingfisher is shrill and piping; it is frequently emitted when the bird is on the wing.

We have still to notice some curious superstitions which prevailed in ancient times, and some which have even come down to our own day, in connection with this bird. The Greeks and Romans, naturalists as well as poets, believed that the Kingfisher built a floating nest, and that the elements were so kind to her, that during the period of incubation, no storms arose to disturb her in her work, or render her situation perilous. Hence, it was supposed that the waters always remained smooth during the period in which the Kingfisher was engaged in hatching her eggs, and that the mariner might safely venture on the uncertain element which was the scene of his calling, without any fear of meeting with untoward accidents in his course. Indeed, so far did some of the old poets carry their credulity, that they actually believed the bird to have some secret power of stilling the waves. From these circumstances the term "Halcyon days," applied to the supposed period of incubation of this bird, came to be regarded as synonymous with calm, and it is still frequently used metaphorically, to express a duration of quiet happiness. These ancient notions are frequently referred to also by our older English poets. Some of the more modern superstitions with regard to this bird, seem to have a certain connection with its supposed influence over the weather. Thus it is believed in some places, that a Kingfisher, suspended by its bill, will always turn its breast to the north; and that if accurately balanced and suspended by a single thread from its back, its bill will point in the direction of the wind, even when it is kept in-doors. Some of the other notions entertained about the Kingfisher are still more absurd; its head and feathers have been regarded as a protection against witchcraft, and as a certain means of securing the affections of a coy mistress.

THE INDIAN KINGFISHER (*Alcedo bengalensis*), a common species in most parts of India, is very nearly allied to our European kingfisher, which it also resembles in its habits. It frequents the brooks and rivers, excavating its burrows for the purpose of nidification in the steep banks and in mud walls. Its food consists of small fishes and aquatic insects, and it is often seen perched on a stick in the paddy fields watching for its prey in the shallow water.

THE BIRU KINGFISHER (*Alcedo Biru*) is common in Java, where it follows the same mode of life as its European relative. Dr. Horsfield describes it as darting in short rapid flights along the surface of the water, emitting from time to time a note so shrill and piercing as to be very disagreeable to the hearer. It is also often seen perched on trees on the banks of rivulets, and its food, like that of the two preceding species, consists of small fishes and insects.

THE AZURE KINGFISHER (*Alcyone azurea*), a very abundant species in Australia, especially in its southern and south-eastern parts, belongs to a genus which is principally distinguished from that including our European species, by the existence of only three toes in each foot, the outer toe being entirely deficient. It is rather a larger bird than our common kingfisher; the whole upper part is of a fine ultramarine blue colour, the wings are black, the lower surface is ferruginous orange, becoming nearly white on the throat; a line of the same colour runs from the base of the bill to the eye, and there is a tuft of yellowish-white feathers on each side of the neck.

It is found along the margins of brooks and ponds, where it perches on the bare branch of a tree overhanging the water, dashing down from its resting-place upon the small fishes which pass underneath it. During the breeding season, which commences in August, the male is very pugnacious, and at all times this Kingfisher is a solitary bird. The burrow of the bird, like that one of our British species, is made in the bank of the stream, and its floor is occupied by the bones of fishes disgorged by the inhabitants.

THE PIED KINGFISHER (*Ceryle rudis*) belongs to a genus also closely allied to *Alcedo*, and agreeing with it in the number and arrangement of the toes, but distinguishable at once by the great stoutness of its short tarsi. The Pied Kingfisher is found abundantly in India, and thence westward to Africa, extending its range, according to some statements, even as far as the Cape of Good Hope. Specimens also occasionally cross from North Africa, where the bird is very common, into some of the southern countries of Europe, such as Spain and Sicily.

The Pied Kingfisher is about the size of the song-thrush, measuring rather more than eight inches in length, exclusive of the bill. The feathers of the upper parts are white, marked with black spots of various forms; the lower parts are pure white, with a deep black collar below the base of the neck; the wings are black, with the feathers bordered with white, and the feathers of the tail are also varied with black and white. This species, which is rendered elegant by the vivid contrast of its pied plumage, differs somewhat in its habits from the preceding kingfishers; for instead of watching for its prey from a fixed station, it hovers over the surface of the water and darts down perpendicularly when its victim comes within sight. Dr. Pearson says—"From a height of twenty to thirty feet it plunges down, dead as a stone, to the water, and remains below it so long that the ripple over the surface clears away sometimes before it comes up again." This bird, like the preceding, breeds in holes in steep banks.

THE GREAT AFRICAN KINGFISHER (*Ceryle maxima*), one of the largest species of the present family, is an inhabitant of the western part of tropical Africa. The general colour of the whole back, including the wings, is lead grey, but the wings are covered with numerous white spots; the tail feathers are blackish, with a row of seven white spots on each; the crest of rather long feathers with which the head is adorned is black; the lower surface is white, with numerous blackish spots on the flanks, and a broad pale brown band across the chest; the sides of the throat and cheeks are also marked with lines of small black spots. The whole length of this fine bird is about fifteen inches; in its habits it resembles the preceding species.

THE BELTED KINGFISHER (*Ceryle Alcyon*).—Besides the preceding species and some others inhabiting the eastern hemisphere, the genus *Ceryle* includes some American birds, amongst which the Belted Kingfisher is the best known. It is an abundant species in most parts of the United States. In its colours it much resembles the preceding species, but is readily distinguished by its having a broad collar of white round the neck. It is also smaller in size, measuring only about twelve inches and a half in length.

Wilson's account of the habits of this bird is as follows:—"Like the love-lorn swains of whom poets tell us," says the great American ornithologist, "he delights in murmuring streams and falling waters; not, however, merely that they may sooth his ear, but for a gratification somewhat more substantial. Amidst the roar of the cataract, or over the foam of a torrent, he sits perched upon an overhanging bough, glancing his piercing eye in every direction below for his scaly prey, which, with a sudden circular plunge, he sweeps from their native element, and swallows in an instant. His voice, which is not unlike the twirling of a watchman's rattle, is naturally loud, harsh, and sudden; but is softened by the sound of the brawling streams and cascades among which he generally rambles. He courses along the windings of the brook or river, at a small height above the surface, sometimes suspending himself by the rapid action of his wings, like certain species of hawks, ready to pounce on the fry below; now and then settling on an old, dead, overhanging limb to reconnoitre. Mill-dams are particularly visited by this feathered fisher; and the sound of his pipe is as well known to the miller as the rattling of his own hopper." The nest of this species is made in the perpendicular bank of his favourite stream, into which he digs horizontally by means of his bill and claws often to the depth of four or five feet. The eggs are five in number, and of a pure white colour. In the colder states of the Union this bird would appear, from Wilson's statements, to be only a summer visitor; at least it departs from Pennsylvania and the more northern states at the approach of winter, and returns to them again in the spring.

Of the South American species we shall only mention three, namely—the STARRY KINGFISHER (*C. torquata*), a rather large species, which somewhat resembles the preceding in colours, being bluish-ash above, and chestnut-brown beneath, with a white collar and spots—a native of South America and Mexico; the RED and GREEN KINGFISHER (*C. tricolor*), an inhabitant of Guiana and Brazil, about eight inches in length, with the upper parts green, sparingly spotted with white, and the lower surface red; and the GREEN and WHITE KINGFISHER (*C. Americana*), somewhat smaller than the preceding, from which it differs in having the lower surface white.

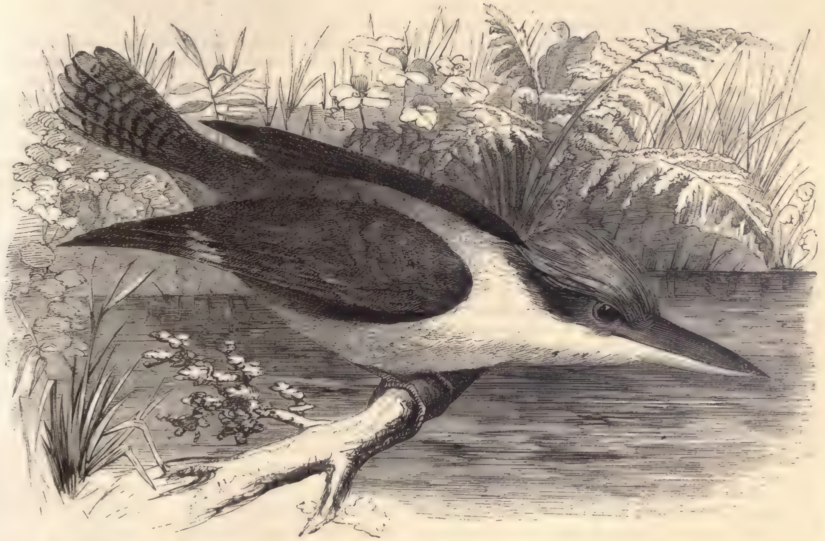
THE GIANT KINGFISHER (*Dacelo gigas*), which is the largest species of this family, measuring about eighteen inches in total length, is an inhabitant of New South Wales, where it is known to the colonists by the name of the *Laughing Jackass*, conferred upon it on account of its singular cry, which, as Mr. Gould says, "is so extraordinary as to be unlike that of any other living creature." This cry, which is described as resembling a sort of loud gurgling laugh, and is compared by Captain Sturt to "a chorus of wild spirits," may be heard at a considerable distance, and the bird is especially vociferous at dawn and sunset.

The Giant Kingfisher (fig. 106) has a much larger and stronger bill than the preceding species, and this character is found in all the birds belonging to the genera *Dacelo* and *Halcyon*. Its head also is very large, and covered with a sort of crest of longish feathers, which are dark-brown on the crown of the head, and pale-buff on the sides. A broad dark-brown band passes from the base of the bill round the back of the head, and the back is dark-brown. The back of the neck is pale-buff, the whole lower surface white, the wings, crests, and rump, greenish-blue and black, the quill feathers of the wing black, with a white spot near the outer margin of the wing, and the tail is chestnut-brown, banded with black, and with the extreme tip, the margins of the outer feathers, and a band before the tip, white. The upper mandible is blackish-brown, the lower one pale buff.

The Giant Kingfisher is by no means a shy bird, but, on the contrary, exhibits a prying and inquisitive disposition, which, indeed, is indicated in his general aspect, and especially in the somewhat corvine expression of his face. He will perch on the branch of a tree and watch with the greatest curiosity the lighting of a fire by any party travelling through the bush in his vicinity. He flies and settles quite noiselessly, so that his being in the neighbourhood is seldom known until he breaks out into his usual laugh, probably expressive of his satisfaction at the proceedings going on before him; but his cachinnatory explosion often costs him his life, "for if, as is often the case," says Mr. Gould, "the traveller's larder be ill provided, and his appetite keen, but a few minutes elapse before it is roasting over the fire it was lately surveying with so much curiosity."

The name Kingfisher applied to this bird, and indeed to all the following species, is, perhaps, a misnomer, and can only be justified by the desire to indicate how closely these birds are allied to the true kingfishers. None of them appear to be aquatic in their habits, but they feed upon insects and other terrestrial animals, so that the name of *Hunters* is more applicable to them than that of Fishers. Accordingly some naturalists have proposed to denominate these birds *Kinghunters*, and the French term *Martins chasseurs*, expresses the same opposition to the habits of the Kingfishers, or *Martins pêcheurs*. The Giant Kingfisher is a great hunter, feeding voraciously upon insects, reptiles, and crabs. Mr. Gould says, "it devours lizards with avidity, and it is not an unfrequent sight to see it bearing off a snake in its bill to be eaten at leisure." It also preys on small mammalia. Hence, unlike the true kingfishers, this bird is not confined to the vicinity of water; indeed Mr. Gould believes that it seldom if ever drinks, so that the driest plains serve it as a habitation. It breeds in August and September, depositing its eggs, which are of a beautiful pearl white colour, in a hole in some large gum-tree, upon the dust and decomposed wood which lines the bottom. It defends its nest and young with great courage, and its formidable bill enables it to inflict very severe wounds.

Fig. 106.



The Giant Kingfisher (Dacelo gigas).

This bird is represented in other parts of Australia by nearly allied but distinct species; in the north-eastern part of that continent its place is taken by Leach's Kingfisher (*D. Leachii*), and along the northern and north-western coast, by the Buff-breasted Kingfisher (*D. cervina*). Another species (*D. Gaudichaudii*) inhabits New Guinea; their mode of life is, for the most part, very similar to that of the Giant Kingfisher of New South Wales.

THE AUSTRALIAN KINGFISHER (*Halcyon sancta*).—The numerous species to which the generic name of *Halcyon* has been applied, are all inhabitants of the eastern hemisphere, in all parts of which, with the exception of Europe, some of them occur. They have three toes in front and one behind, but the inner front toe is very small. The present species, which is called the Australian Kingfisher, from its receiving the name of kingfisher from our colonists, is generally dispersed over the whole continent of Australia. It measures about eight inches in length, including the powerful bill, which is black, with the base of the lower mandible white; the crown of the head, the back, and scapularies, and the wings and tail are green, the latter tinged with blue; a line running from each nostril over the eye is buff; a broad blackish-green band separates the green of the head from a broad buff collar which surrounds the neck; the throat is nearly white, and the whole lower surface of the body buff, deeper on the flanks.

This handsome species is a summer resident in the southern parts of Australia, from which it retires northwards after the breeding season is over. Its food consists principally of insects, of which it devours great quantities; and Mr. Gould states that, on the banks of the Hunter river, its favourite diet consists of the larvæ of a species of ant, which it procures by digging holes into the nest. It will also devour small snakes and lizards, and on the coast it feeds freely on crabs and other Crustacea. It breeds in the hollow spouts of the gum-trees, or in hollow apple-trees, and the breeding season commences in October. The eggs are four or five in number, and pure white.

Several other species of the genus *Halcyon* inhabit Australia; they are all birds of brilliant plumage, but their habits are very similar to those of the preceding species.

THE SACRED KINGFISHER (*Halcyon sacra*), which is a native of the Society Islands, and of some other parts of the Polynesian Archipelago, is of a blue colour above, and whitish beneath; over each eye is a pale red streak, and underneath a blue stripe. It is called the Sacred Kingfisher on account of the veneration in which it was held by the natives of Otaheite, who regarded it as a divinity, under the name of *Eatua*.

THE WHITE-HEADED KINGFISHER (*Halcyon leucocephala*), a native of India and Java, measures about twelve inches in length, and is of a bluish-green colour, with the head and neck, and the lower surface, yellowish-white; the crown of the head is streaked with black; the bill is of a blood-red colour. This species, which is called the *Gurial* by the Hindoos of Bengal, where it is more common than in other parts of India, is a powerful and courageous bird; one of them has been seen to compel a hawk of considerable size to quit his hold upon it by a severe blow upon the chest. Unlike the preceding species, this bird is a fisher, perching upon a bush or tree close to the water, and watching there for the appearance of its prey, upon which it darts down with a sudden and violent plunge. Its note is a sort of screaming laugh.

THE INDIAN KINGFISHER (*Halcyon fusca*), an abundant species in the peninsula of Hindostan, and in the countries to the eastward, is also a fishing bird, commonly frequenting the banks of rivers and brooks, and the wet paddy-fields, where it preys upon small fishes, frogs, tadpoles, and aquatic insects. It does not confine itself to these situations, however, but also visits the dry cultivated ground in search of small lizards, grasshoppers, and other insects. Its voice is a loud, harsh, rattling scream. Passing over several other Indian species, we may notice—

THE RED-BELLIED KINGFISHER (*Halcyon semicærulea*), an inhabitant of Senegal, and other parts of the west coast of Africa. This bird is of a bluish-green colour above, with a black streak behind the eyes, and a black spot on the wings; the lower surface is yellowish-red. The length of the bird is about twelve inches. It is described by Forster as the Crab-eating kingfisher, but this may be only an occasional habit. Other African species are the SENEGAL KINGFISHER (*H. senegalensis*); the BLUE-COLLARED KINGFISHER (*H. cinereifrons*); the CHELICUTI KINGFISHER (*H. Chelicuti*); and the BROWN-HOODED KINGFISHER (*H. fuscicapilla*), the last from the Cape of Good Hope.

THE TERNATE KINGFISHER (*Tanysiptera Dea*), so called from its having been originally discovered in the island of Ternate, is also abundant in New Guinea, where, according to Lesson, it is named *Manesoukouv* by the natives. It is remarkable for having the two middle feathers of the wedge-shaped tail excessively elongated in the male; they are narrowed in the middle, and again expanded at the apex. Two other allied species have been described.

THE THREE-TOED KINGFISHER (*Ceyx tridactyla*), with three or four allied species, inhabits the islands of the Eastern Archipelago. Little is known of the habits of these birds, which differ from *Halcyon*, as *Ceryle* does from *Alcedo*, namely, in the want of the inner front toe. The foot has only three toes, two in front, and one behind, and the anterior toes are united for the greater part of their length. The three-toed Kingfisher is of an azure-blue colour above, and yellowish-white beneath; its bill is yellowish.

THE GREEN JACAMAR (*Galbula viridis*). The group to which the name of Jacamars is given by ornithologists, is distinguished by having a long, slender, straight, or slightly curved and pointed bill, less powerful than that of the species described in the preceding pages; a long, graduated tail, short tarsi, and the toes arranged either in two pairs, or two in front and one behind, the anterior toes being united. They are all brilliant birds, and inhabit the tropical parts of the western hemisphere.

The Green Jacamar is an inhabitant of Brazil and Guiana, where it dwells in the recesses of the forest, and passes its life in solitude. It feeds entirely upon insects, which it pursues with a short but rapid flight. According to some writers, this bird has an agreeable song. The eggs are deposited in a hole of a tree. This bird is about eight inches in length, and is very brilliant in its appearance, the whole upper surface of the body being of a beautiful golden-green colour, the breast yellow, traversed by a broad band of golden green, and the belly reddish.

THE LONG-TAILED JACAMAR (*Galbula leptura*)—Plate 7, fig. 22—a native of Brazil and Guiana, is of a golden coppery-green colour above and red beneath, with a golden green band across the breast, and the chin and throat white; the tail is long, with the feathers gradually increasing in length to the two middle ones, which are the longest, and golden green, the rest being red. The total length of the bird is rather more than ten inches. The Long-tailed Jacamar resides in the moist woods, where it leads a solitary life, perching upon branches at a moderate height from the ground, and often sitting there motionless for a considerable portion of the day. It is not uncommon, and its flesh is sometimes eaten by the natives of Brazil. Its song is said to be agreeable, although very short.

THE PARADISE JACAMAR (*Galbula paradisea*) is another long-tailed species, which inhabits Guiana. It measures nearly a foot in length, but of this a great deal is to be attributed to the tail, of which the two middle feathers are six inches long; the feathers on each side of these diminish rapidly in length, the outermost being only about one inch long. Its plumage is green above, with various lustres, according to the light in which it is viewed; the head is dull violet-green, and the throat is white. This species is less retired and solitary in its habits than the others, being found in the more open parts of the forest, and usually in pairs.

THE THREE-TOED JACAMAR (*Jacamaralcyon tridactyla*). This species differs from the other Jacamars in possessing only three toes; two in front, united to each other, and one behind. It is of a dull green colour above, with the forehead and crown of the head reddish-white; the throat and cheeks are black, and from the throat a black streak descends along the sides of the body to the lower tail-coverts, which, with the vent, are also black; the rest of the lower surface of the body is reddish-white. This curiously marked bird is a native of Brazil. Its habits agree with those of the other species.

THE GREAT JACAMAR (*Jacamerops grandis*)—Plate 8, fig. 23—has the feet similar to those of the ordinary species, but the bill, which is rather stout, is slightly curved throughout its whole length. It is about eleven inches in length. The plumage of the whole upper surface is of a rich and brilliant golden-green, exhibiting a more or less reddish lustre in certain lights; the quill-feathers of the wings are blackish externally, and the lower surface is red. The bill is black. This bird is also a native of the tropical parts of America.

THE COLLARED PUFF-BIRD (*Bucco collaris*). The curious group of birds called Puff-birds, from their habit of puffing out their plumage so as to appear much larger than they really are, is placed amongst the Alcedinidæ by Mr. G. R. Gray, although it certainly appears to have considerable affinity with the small group of birds called *Barbets*, belonging to the scansorial family of the Woodpeckers. They have a very stout, conical bill, somewhat inflated at the base, which bears several tufts of strong bristles; and the toes are arranged in two pairs, the two outer toes being the longest. There are numerous species of this group, all inhabitants of tropical America, where they lead a solitary, and somewhat sedentary life in the recesses of the forests. They live exclusively upon insects, and breed in the holes of trees.

The Collared Puff-bird, which is an inhabitant of Guiana, measures rather more than seven inches in length; it is of a red colour, with transverse black streaks above, whitish beneath, with a black band across the breast, and above this a tawny one; the feathers of the tail are also banded with black.

THE WAX-BILLED BARBACOU (*Monasa atra*). Of the numerous species of Puff-birds inhabiting South America, we need only refer to this species, the type of a genus (*Monasa*), the species of which are rather more active, and less solitary in their habits, than the rest of their allies. They possess longer wings, and fly better than the *Buccos*, and although they reside in the forest, they often seek the insects which constitute their food over the inundated savannahs. They are said to breed sometimes in the holes of trees, and sometimes in the earth. The Wax-billed Barbacou measures nearly a foot in length, and is black above, ash-coloured beneath; the bill is of a fine carmine colour. It is a native of Guiana. With these birds we quit the family of the Alcedinidæ.

FAMILY VI.—MEROPIDÆ.

The birds of this family present certain points of resemblance both to the Kingfishers and Swallows amongst the Fissirostres on the one hand, and to the slender-billed birds of the following group (Tenuirostres) on the other. They have an elongated, and more or less curved bill, of which the gape extends backwards beneath the eyes; their nostrils are partly concealed by short bristles; their wings are long and pointed, indicating considerable powers of flight; and they have a long and broad, usually more or less wedge-shaped tail, of which the two middle feathers are generally a good deal longer than the rest. Their tarsi are very short, and the long toes are placed as in birds generally, namely, three in front and one behind; the anterior lateral toes are united to the middle one, the outer one throughout its whole length. The brilliant birds belonging to this family are all inhabitants of the eastern hemisphere, especially of its tropical portions. Their food consists of insects, which they capture in the air, like the Swallows, to which they bear so much resemblance. Bees and wasps constitute a favourite portion of their nourishment, from which circumstance they have received the English name of *Bee-eaters*. The French, on the same account, call them *Guêpiers*, or wasp-catchers. Of the African species, one—

THE COMMON BEE-EATER (*Merops apiaster*)—Plate 8, fig. 24—visits the south of Europe regularly as a summer bird of passage; and as occasional specimens find their way northwards to this country, it is recorded as a British bird. This beautiful bird measures nearly eleven inches in length, from the tip of the bill to that of the elongated middle feathers of the tail. Its bill is black, and a black streak runs from its base under the eye, to join a bluish-black band which crosses below the throat; the forehead is bluish; the upper surface is of a fine reddish-brown colour, becoming yellow on the rump; the quill-feathers of the wings are greenish-blue, with the tips black; the tail-coverts are bluish-green, and the tail-feathers green. The lower surface is bright green, with the chin and throat of a rich saffron yellow colour.

In Africa, this species has been observed nearly as far south as the Cape of Good Hope. It also occurs in Madeira, and in the spring passes in troops of twenty or thirty from the northern shores of Africa, in all parts of which it is well known, to the islands of the Mediterranean, and thence in considerable numbers to the south of Europe, where it remains through the summer to breed. It is abundant in Turkey, Greece, and Southern Russia, and is also common in Spain and Italy. Those individuals which visit more northern countries, must be looked upon as stragglers, and the Bee-eater is thus known as an occasional visitor not only to this country, but also even to Norway and Sweden.

In its habits the Bee-eater somewhat resembles the Swallows, hunting about like them in pursuit of insects, which it captures on the wing; it is, however, inferior to the swallows in power of wing. Its favourite food, as is well known in all the countries which it frequents, consists of bees and wasps, and it does not appear ever to suffer any inconvenience from the stings of those irascible insects. In reference to this power possessed by the Bee-eater, and indeed by many other small birds, of swallowing bees and wasps with impunity, Mr. Yarrell says, "I believe that the bird pinches the insect, passing it from head to tail between the points of its mandibles, till, by repeated compression, particularly on the abdomen, the sting is either squeezed out, or its muscular attachments so damaged that the sting itself is harmless." That the throat and stomach of the Bee-eater are not furnished with any protective coat impenetrable by the sting of the bees, is evidenced by the curious mode of catching these birds described by Belon, as practised in the island of Crete, where they abound during the summer, and referred to, on the authority of the old French naturalist, by our countryman Izaak Walton, in his "Complete Angler." In this island the boys fasten a cicada upon a bent pin or a fish-hook, which is attached to a long slender line; the insect is then allowed to fly into the air, when the Bee-eaters are hawking about; one of the latter is pretty sure to dash down upon it, and is captured by the concealed hook. The bird is said to have an agreeable odour, and its flesh is very good. Its note, which is emitted on the wing, is described as a pleasant and rich warble.

The Bee-eater breeds in a hole, which it excavates in the bank of a river, to the depth of about six inches, and lines with soft moss for the reception of its eggs. It is gregarious in the breeding season, as at other times; and in Southern Russia, particularly about the rivers Don and Wolga, where the birds are very abundant, they dig into the clay banks of the rivers in such numbers, and so close together, that the banks are described by some travellers as almost resembling a honeycomb. The eggs are from five to seven in number, and of a pure white colour.

THE BLUE-HEADED BEE-EATER (*Merops nubicus*). Of several other African species of the genus *Merops*, the Blue-headed Bee-eater is one of the most striking. It is an inhabitant of Western Africa, and measures thirteen inches in total length, including the two very long feathers of the middle of the tail. The plumage of its upper surface, including the wings and tail, is of a bright brick-red; the breast and belly are of a fine rose colour; the head is greenish-blue, with a black mark behind each eye; the tail-coverts are bright blue. The tail is nearly square at the extremity, but the two middle feathers project more than three inches beyond the others; these are slender, pointed, and tipped with black.

THE INDIAN BEE-EATER (*Merops viridis*), which is an abundant bird in all parts of Hindostan, and also in Ceylon, measures about nine inches in length, and is of a golden-green colour above, and green beneath, with the throat blue; on each side of the head there is a black band. The middle feathers of the tail are much elongated. In seeking its insect prey this bird exhibits the habits of the Fly-catchers, that is to say, it takes up its station on the branch of a tree or bush, or on some other elevated situation, from which it dashes off in pursuit of any unlucky insect that passes by, returning again to its perch after having made its capture. Mr. Layard observed that these birds sometimes beat their prey against their perch before swallowing it. This mode of procuring food appears to be adopted principally in the middle of the day, for in the morning and evening the Green Bee-eaters are observed hawking about actively in pursuit of insects, in the manner of the Swallows, and often in company with those birds. They possess the power of gliding along for some distance without closing the wings, so that, as described by Mr. Pearson, the flight of the bird consists of two parts—"a rapid commencement, in which the wings flap rapidly; and a quick glide, with the wings and tail fully expanded. Its motion, especially in this latter position, is extremely elegant." Its note is a loud whistling, which, however, is described by Dr. Jerdon as rather pleasant.

THE PHILIPPINE BEE-EATER (*Merops philippinus*) is another Indian species, which inhabits both the continent and islands, as far east as those from which it takes its name. It is about the same size as the preceding species, and is of a dull-green colour above, light-green beneath, with the rump and tail bluish-green; on each side of the head there is the usual black streak. It is commonly met with in wooded districts, where it hunts in small parties, perching upon trees and other objects, and dashing off over a considerable circuit in pursuit of its insect prey, before returning to its resting place. Wet places, such as paddy-fields, appear to be favourite resorts of this bird. Its note resembles that of the preceding species.

THE VARIEGATED BEE-EATER (*Merops ornatus*), which appears to be the only species inhabiting Australia, is abundantly distributed over the whole of that continent, migrating from north to south in the spring, and in the opposite direction at the approach of winter. It arrives in New South Wales in August, and like the Swallows, is a favourite with the colonists, as the harbinger of fine summer weather. This species measures between nine and ten inches in length, including the elongated middle tail feathers; its general colour consists of various shades of green; the bill is black, as are also a broad streak on each side of the head, and a crescent-like band below the throat; the throat is of a rich orange-yellow colour; the tail is black, with the two middle feathers bluish, as far as the extremity of the other tail feathers, where they are much narrowed, the projecting portion being very slender, and black. The habits of this bird resemble those of the preceding species; during the day it frequents open parts of the forests, and in the evening the banks of rivers, where great numbers are often seen together. It breeds in the sandy banks of rivers, in which it digs a hole of about a yard in depth, terminating in a small chamber, where the eggs, four or five in number and beautifully white, are deposited on the bare sand.

THE SWALLOW-TAILED BEE-EATER (*Melittophagus hirundinaceus*) belongs to a genus which is peculiar to Africa, and of which all the species have the tail more or less forked. It appears to be spread over a considerable portion of the African continent, but it is most abundant in the south. The general colour of the plumage of this fine species is a brilliant green, both above and below; the forehead, belly, and tail-coverts, are blue, or greenish-blue; a black stripe runs from the base of the bill through the eye; the chin and throat are bright orange-yellow, and this colour is separated from the green of the breast, by a brilliant azure band; the quill-feathers of the wings are of a fine cinnamon-brown colour, and those of the tail dark-green, tipped with white, and gradually increasing in length from the middle outwards, forming a tail as strongly forked as that of a swallow. The length of this bird is about eight inches and a half. The Swallow-tailed Bee-eater is one of the most brilliant and elegant species of the family.

THE AZURE-THROATED BEE-EATER (*Nyctiornis Athertonii*). This species, which is an inhabitant of India, resides solitarily in the deepest recesses of the forests, where it appears to pass a quiet and sedentary existence. It is very shy and wary, so that specimens are obtained with much difficulty. The food of this species consists partly of bees, and other hymenopterous insects, and partly of beetles, which it captures by watching for their passage from a perch, and then suddenly starting in pursuit of them. This species has a stout bill, more curved than in the preceding forms, and the tail is nearly square at the end.

The Bee-eaters close the varied series of the Fissirostral birds, and we have now to enter upon the consideration of a group which presents an equal, if not a greater amount of diversity.

TRIBE II.—TENUIROSTRES.

OF all the groups of passerine birds, this certainly contains the most apparently heterogeneous elements, and it is very difficult to give any general characters which shall include the whole. The leading character of the birds composing this tribe, consists in the slenderness of the bill, which is usually elongated, sometimes straight, and sometimes curved. In some of these birds, however, the bill is but little longer than in the slender-billed dentirostral birds belonging to the next tribe; but there is this difference between them, that in the Tenuirostres, the upper mandible, although acute at the apex, is not hooked, and its margins are not armed with teeth, which are the characteristic marks of the Dentirostres. The Tenuirostral birds are for the most part inhabitants of warm climates, and in nearly all of them, those muscles of the lower larynx which are the agents of song, are entirely wanting. In Mr. George Gray's arrangement, the Tenuirostral birds form five families, some of which include a great number of species; but as little is known of the habits of many of these, we need only refer to the more remarkable examples of each.

FAMILY I.—UPUPIDÆ.

In the Upupidæ, of which the singular European Hoopoe is the type, the bill is long and slender, gently curved throughout its length, and acute at the tip; the small nostrils are placed close to the base of the bill; the wings are rather short and rounded; the tarsi are short and stout, and terminated by three long and strong toes, armed with curved claws of considerable size. These birds are peculiar to the Eastern hemisphere.

THE COMMON HOOPOE (*Upupa Epops*)—Plate 8, fig. 25—which is a well-known bird in some parts of Europe, is, however, a bird of passage in that continent; its true home being in Africa, and it is also met with in many parts of Asia. It occurs occasionally, but not rarely in Britain, especially in the southern counties. The Hoopoe measures about twelve inches in length; its head and neck are of a pale brick-red colour; the back is of a purple red tint in front, reddish-white and banded with black behind; the wings are black, with some irregular white bands across them, and the tail is black, with a single transverse white band. The head is adorned with a graceful crest of long feathers, each of which has a black and white tip, and the whole aspect of the bird, with this striking ornament erected, is singularly elegant.

In their summer migration, the Hoopoes proceed as far to the north as Denmark and Sweden, and they breed in most parts of Europe; but the individuals which visit this country, usually make their appearance in the autumn, and probably come to us from the more northern parts of the European continent, after the breeding season is over. They have, however, been known to breed in this country. The nest is made of a few stalks of grass, mixed with feathers, and is built in the hole of a tree; the eggs, which are generally five or six in number, are of a pale lavender-grey colour.

The Hoopoe is generally met with in woods in the vicinity of marshes, where they seek their food, which consists of worms and insects. They walk and run upon the ground with great ease when thus engaged. In the neighbourhood of Bordeaux, these birds are met with in great numbers, upon an extensive range of marshy ground occupied by numerous pollard willows, which are grown there for the sake of their long shoots. The rotten summits of the trunks of these trees are visited by the Hoopoes, which find in them an abundant supply of insects. The note of the Hoopoe closely resembles the word *hoop*, pronounced softly and frequently repeated; from this the name of the bird is derived.

THE INDIAN HOOPOE (*Upupa nigripennis*) is a species very nearly allied to the preceding, from which it differs principally by its shorter and blacker wings, and by the absence of white in the tips of the crest feathers, except occasionally on the hinder part of the crest. It inhabits India and Ceylon, where it is tolerably common, taking up its abode in woods, groves of trees, hedges, and even in single trees, and sometimes about old buildings. Like the European Hoopoe, it feeds on the ground, walking and running with great facility, and picking up insects and worms as it progresses. It is said by Lieutenant Burgess to be partial to the sandy ground in the Deccan, feeding upon the Ant-lions, whose conical pitfalls abound in such situations. In Ceylon, it has been observed investigating the dung of cattle in search of the beetles with which that substance usually swarms. Its note resembles that of the common Hoopoe. This species breeds in holes in old buildings and mud walls, into which it brings a few fibres of some soft substance for the reception of its eggs, which are of a very pale blue colour.

THE RED-BILLED IRRISOR (*Irrisor erythrorhynchus*) belongs to a genus, of which numerous species are found in Africa, in which the tail is very long and the head destitute of a crest. This species is about fifteen inches in length, and of a blackish-green colour, with the abdomen black, the wings and tail spotted with white, and the rostrum and feet red. These birds inhabit the tall trees, where they creep along the branches in search of the insects and larvæ which constitute their principal nourishment. They are also said to feed upon figs.

THE SUPERB PLUMED BIRD (*Epimachus magnus*). The Plumed birds, as they are called, resemble the Birds of Paradise in the great development of some parts of their plumage, and also in the great brilliancy of colour exhibited by most of the species. They have accordingly been placed by many writers with the Birds of Paradise, or in their immediate neighbourhood, and they certainly differ but little from those birds, except in the form of the bill. The species are inhabitants of New Guinea and its dependencies.

The Superb Plumed Bird is about the size of a pigeon, but from the enormous development of the tail feathers, of which the middle ones are twenty-eight inches long, the whole measures about four feet in length. The general colour of this beautiful bird is violet black; the back of the head and neck, and the fore part of the belly, are of a brilliant glossy green colour; the scapulars are very remarkable for their peculiar form, the shafts being curved upwards and furnished with very short webs on the upper surface, whilst the barbs of the lower surface are very long, and of a purplish-black colour at the base; but the tips of these barbs for a considerable length, are of a most brilliant golden-green colour. From beneath each wing springs a tuft of light feathers, resembling in texture those of the common Bird of Paradise, of a dusky colour, and about eight inches and a half in length, and on each side of the tail there are about half a dozen long and pointed feathers of a bronzed and gilded green colour, with unequal webs; the tail feathers are blue-black and brilliant, the two middle ones being chestnut.

THE MAGNIFICENT PLUMED BIRD (*Epimachus magnificus*). This species, which is rather smaller than the preceding, is of a general black colour, with violet and green reflections in certain lights; the throat and breast exhibit the most vivid metallic blue, green, and violet tints, in a perfectly circumscribed patch of considerable size and nearly triangular form, bounded below by a bright, orange-yellow, transverse line; the tail, unlike that of the preceding species, is short, and nearly square, and on each side of the base of the tail beneath the wings, there spring a few light decomposed plumes, resembling those forming the tufts of the true Birds of Paradise. This bird inhabits New Guinea.

THE RIFLE BIRD (*Ptiloris paradiseus*). This magnificent species has only been discovered in the south-eastern corner of Australia, between the Hunter River and Moreton Bay. It measures nearly eleven inches in length. The two sexes are very different in their colours; as Mr. Gould remarks, "While the male is adorned with hues only equalled by some species of the *Trochilidæ*, or Humming-birds, the dress of the female is as sombre as can well be imagined." The general colour of the plumage of the male is a rich velvet black, with a brownish-violet lustre on the upper surface; the feathers of the abdomen and flanks are broadly margined with rich olive-green; the crown of the head and the throat are covered with beautiful scale-like, metallic, bluish-green feathers, and the two middle feathers of the tail are also of a metallic-green colour. The female is very dissimilar. The whole upper surface in this sex is greyish-brown, the feathers of the head having each a white line down the centre; the whole lower surface is buff, paler on the throat, and each feather of the breast and abdomen has a black, arrow-shaped mark upon it. The bill and feet are black in both sexes. Scarcely anything is known of the habits of this bird, which is said to climb about upon the trunks of the trees in the Australian forests. Mr. Gould has described a second species of this genus, under the name of *Pt. Victoriæ*, in compliment to the Queen.

FAMILY II.—PROMEROPIDÆ.

THE birds of this family, to which the name of Sun-birds is frequently applied, are generally splendid in their plumage, and like most birds in which this is the case, they are confined to the tropical parts of the earth's surface. They are, however, common to both hemispheres, although the species found in the Old World all differ in certain respects from those inhabiting America. The majority of the species belong to the Eastern Hemisphere.

The family is distinguished by having the bill long and slender, and usually more or less curved, with the nostrils situated at the base of the upper mandible, and covered by a scale; the wings are of moderate length, and the tarsi short and clothed with broad scales. In their general habits these birds resemble the Humming birds, which they rival in splendour of colouring, frequenting the flowers in search of the small insects usually found amongst the petals, which they extract by means of their long slender bills. According to some writers they also feed upon the sweet juices of the flowers; and from this opinion they have been denominated *Sucriers*, or Sugar-birds, by the French authors.

THE CAPE SUN-BIRD (*Promerops caffer*), the only species of its genus, is, as implied in its name, a native of the Cape of Good Hope, where it exhibits a particular partiality for the flowers of the *Protea*. It measures about fifteen inches in length, and has a very long, wedge-shaped tail, and a slender, black, and slightly-curved bill. The plumage of the upper parts, including the wings and tail, is greenish-brown, with the top of the head varied with grey and brown, and the rump and upper tail-coverts olive-green; the throat is dingy white, bordered on each side by a black line; the breast is brownish-orange, the belly nearly white, spotted with brown, and the lower tail-coverts are of a fine yellow colour. According to Le Vaillant's observations, this bird feeds upon the juices of flowers. When he kept them in confinement, he procured the flowers of the *Protea* and other plants to which the birds are attached, and they resorted to them freely in search of nourishment; or, in default of flowers, they fed readily upon honey mixed with water. They build their nests on the forked branches of trees.

THE BRONZED SUN-BIRD (*Nectarinia ænea*). The genus *Nectarinia*, to which this bird belongs, includes upwards of a hundred known species—all inhabitants of the warm regions of Africa and Asia. Of these we can of course only notice a few, and we may commence with the African species, of which the Bronzed Sun-bird is one.

In the male of this species the whole upper surface is of a bronze colour, with bluish and greenish tints in certain lights; the wings and tail are of a bronzed black, and the lower surface of the body, the bill, and feet are black. The female, on the other hand, is of an olive colour above and blackish-brown below. This bird makes its nest in the hole of a tree, where it lays five or six eggs of a pale rose colour, with small reddish spots.

THE BEAUTIFUL SUN-BIRD (*Nectarinia pulchella*), which is an inhabitant of the west coast of Africa, and especially of Senegal, is a charming little species, of a brilliant metallic-green colour, with the exception of the breast, which is red, and the wings and tail which are black. The bill and feet are also black. These are the tints of the male, in which the two middle tail-feathers are about two inches longer than the rest; the female is far more sober in her clothing, exhibiting only different tints of brown. The length of the bird is from six to seven inches.

THE VIOLET-HEADED SUN-BIRD (*Nectarinia violacea*), a native of the Cape of Good Hope, is a rather smaller species than the preceding. It has the head and neck of a violet colour, passing on the throat to metallic blue and green; the rest of the plumage is olive-green, with the exception of the abdomen which is orange colour. The female is of an olive-green colour. The bill and feet are black in both sexes. The male is said to have an agreeable song. The nest of this species is built in a bush, and composed of moss and lichens externally, with an inner lining of hair. The eggs are usually five in number, and yellowish-white, with brown dots.

THE SHINING SUN-BIRD (*Nectarinia famosa*), the GREEN SUGAR-BIRD of the Dutch colonists at the Cape of Good Hope, where the species is very abundant, is one of the most beautiful and remarkable of the African species. It measures rather more than nine inches in length, and has a long tail, of which the two middle feathers are about two inches longer than the rest. The general colour of the plumage of the male is a fine golden green, passing to steel blue on the lower part of the belly. The quill feathers of the wings and tail are violet black; but the secondaries and the two elongated middle tail feathers are margined with golden green; a deep-black line runs from the base of the bill to the eye, and on each side of the breast there is a small tuft of yellow feathers. The bill and feet are black. The female is smaller than the male, and of a yellowish-grey colour above, yellow beneath. The male is said to have a pleasing song. The nest is composed of fibres and moss, and lined with hair. The eggs are four or five in number, and of a greenish colour.

THE SPLENDID SUN-BIRD (*Nectarinia splendida*), another African species, and the last from that continent to which we shall refer, is remarkable for the brilliancy of the violet tint, with purple and blue reflections, exhibited by the head, neck, breast, and abdomen. Over these parts are scattered numerous points of bright red, with golden and green tints. The upper surface is of a fine golden-green colour; and the feathers of the wings and tail are violet black. These are the colours of the male; but the partner of this splendid bird is far more modest in her dress, her plumage presenting only different shades of brown on the upper surface, whilst the lower parts are greyish. The nest is placed in the hollow trunk of a tree; and the eggs, which are four or five in number, are white.

THE PURPLE SUN-BIRD (*Nectarinia asiatica*), which is an abundant species in all parts of India, varies considerably in colour according to the season, the breeding dress of the male being a deep violet-blue, with greenish lustre, and with a tuft of yellow feathers on each side of the breast. The female is of an earthy brown above and greenish-yellow beneath. The length of the bird is about four inches and a half.

The Purple Sun-bird is found both on the continent of India and in Ceylon, and is observed to feed in part upon the honey which it extracts from flowers, and in part upon insects. The latter it captures, not only from the flowers over which it hovers while exploring their recesses with its curved bill, but also from the branches and twigs of plants; and it has been seen by Mr. Jerdon to capture insects on the wing. Its note is a feeble but sweet chirping. The nest which is a dome-shaped, or bottle-shaped structure, is suspended from the end of a twig, and is sometimes attached to the web of a spider in a suitable situation, and composed partly of cobweb, in which Mr. Layard says he has seen the spider still at work, thus rendering the concealment of the nest very complete. Mr. Jerdon describes the process of building adopted by this ingenious little architect as follows:—"The nest was commenced on a thick spider's web, by attaching to it various fragments of paper, cloth, straw, grass, and other substances, till it had secured a firm hold of the twig to which the web adhered; and the nest suspended on this was then completed by adding other fragments of the same materials. The hole is at one side, near the top, and has a slight projecting roof or awning over it." Mr. Layard describes the entrance to the nest in the same way as above; but Captain Tickell states that the opening is at the bottom; so that if he is correct in his determination of the bird, it would seem that there is a remarkable diversity in the practice of different individuals of the same species. The female lays two or three eggs, of a pale greenish-grey colour, with minute dusky spots.

LOTEN'S SUN-BIRD (*Nectarinia Lotenia*) has precisely the same habits, and builds its nest in the same way, as the preceding species, from which it differs in its larger size—the length being about five inches and a half—and in its much longer and more curved bill, which measures an inch in length. Its plumage is glossed with green, and the lower parts, from the breast backwards, are brown.

THE BLUE-THROATED SUN-BIRD (*Nectarinia zeylonica*) is an abundant species in Bengal, and occurs also in other parts of India, in Ceylon, and the Indian islands. It measures about four inches in length, and has the plumage of the upper parts olive, and that of the lower surface yellow; the throat, the front of the neck, and the breast are of a brilliant violet-blue colour. It has a weak, shrill song, compared, by Mr. Blyth, to that of the British hedge-sparrow. The nest is suspended, and has the entrance at the top. Mr. Blyth describes a specimen in his possession as a beautiful fabric. It was attached, nearly throughout its length, to a small thorny twig, and was of an elongated pear shape, composed of soft vegetable fibres, very neatly interwoven with coarser strips of grass, leaves, and fragments of bark on the outside. The inner lining was composed of the softest fibres, which were carried over the lower part of the entrance so as to fasten down its rim, and over the entrance was a roof or canopy. The Hindoos of the vicinity of Calcutta take these birds with bird-lime, and after plucking out the wing primaries to prevent their fluttering, tie them to a stick and carry them about for sale. They will live for a short time upon sugar and water, but Mr. Blyth found that jam was a better food for them.

THE ORANGE-BACKED SUN-BIRD (*Dicæum trigonostigma*). The preceding species, which we have referred to the genus *Nectarinia*, have been divided by many modern writers into several genera, of which, however, the soundness seems rather doubtful. The genus *Dicæum*, of which about twenty-four species are known, inhabiting the countries from India to Australia, is distinguished by having the edges of the mandibles very slightly denticulated, small basal nostrils, and a short, square, or slightly-notched tail.

The Orange-backed Sunbird is a small species, measuring only about three inches in length. It is of a bluish-grey colour, with the belly and a triangular spot on the back orange-yellow. It is an inhabitant of Tenasserim, Malacca, and Sumatra, and also extends into Borneo, where it is not uncommon about Labuan. Its habits are described as resembling those of the English golden-crested wren; it haunts low brushwood, continually emitting a low, shrill chirp, and is so fearless that it may be almost touched before it takes to its wings. The Malays call it the "Spark bird," and this name is said to be very appropriate, as, when darting about the bushes, the cock-bird looks as bright as a flash of fire. The nest is about the size of the egg of a goose, which it also resembles in shape; it is suspended by the smaller end from the slender twig of a tree, and is composed of moss, lined with some white fibres and a few feathers. A young bird, taken from the nest, was brought up by Mrs. Motley upon rice and banana pulp. It became perfectly tame and fearless, and would sit upon the finger without attempting to fly away; "and though its whole body, feathers and all, might have been shut up in a walnut, it would peck at a finger held towards it with great fierceness."

THE CRIMSON-THROATED SUN-BIRD (*Dicæum hirundinaceum*) is an abundant bird in Australia, although from its minuteness it generally escapes the notice of the colonists. The male has the whole upper surface, including the wings and tail, black, glossed with steel blue; the throat and breast, and the under tail-coverts, are scarlet, and the abdomen is white, with a large black patch in the centre. The female is dull black above, with the throat and abdomen pale buff, and the under tail-coverts pale scarlet. The length of the bird is about four inches. This bird is found principally upon the she-oaks (*Casuarinæ*), amongst the upper branches of which it plays about, uttering its pleasing song. It is especially partial to those trees which bear upon their branches a misseltoe-like parasite, of the genus *Loranthus*, upon the sweet and juicy berries of which it delights to feed, as was discovered by M. Jules Verreaux. It also feeds upon insects, and according to Mr. Gould, these constitute its principal nourishment. M. Verreaux indicates that it is by the agency of this bird that the parasite above referred to is transferred from one tree to another. The nest is a beautiful little purse-like structure, with an opening on one side; it is suspended from the twig of a tree, and composed of cotton-like fibres, obtained from the seed vessels of plants. The eggs are three or four in number and dull white, with numerous brown spots scattered over their surface.

THE SCARLET CLOAK-BIRD (*Drepanis coccinea*) belongs to a small genus with a greatly curved bill, of which five species have been discovered in the islands of the South Sea Archipelago. The present species is about six inches long, and has the whole plumage of a brilliant scarlet colour, with the exception of the quills of the wings and tail, which are black. This bird is abundant in the Sandwich Islands, where its splendid scarlet feathers are employed in the fabrication of cloaks and other articles of dress, intended especially for the use of the chiefs. Many specimens of this manufacture are exhibited in the ethnological collection of the British Museum.

THE BRILLIANT HALF-BILL (*Hemignathus lucidus*) is another species very nearly allied to the preceding, and, like it, an inhabitant of the Sandwich Islands. It is remarkable for the singular structure of its bill, which is very long and much arched. In fact the bill does not project in the ordinary manner from the forehead, but rises from its base, so that the summit of the arch is higher than the forehead; the lower mandible is not more than half as long as the upper one, into the lower surface of which it fits. This curious bird has the upper surface of the body olive-coloured; the forehead and cheeks, the throat and breast, are bright yellow, as are also the eyebrows. The female is more sober in her colours, and has no yellow except on the eyebrows. The length of the bird is about six inches.

THE BLUE GUIT-GUIT (*Cæreba cyanea*). Besides the preceding and numerous allied species inhabiting the Old World, a few birds belonging to this family are found in the tropical parts of America. The Blue Guit-guit is one of these. It has a nearly straight, acute bill, of moderate length, and a short square tail. The general colour of its plumage is a fine, lustrous, indigo blue, the forehead is brilliant ultramarine blue, and a violet-black band passes over the eyes. It measures about five inches in length. This beautiful little bird is abundant in Brazil and Guiana, especially in the latter country, whence numerous specimens are brought to Europe, where they are often regarded as Humming-birds. In its habits this bird closely resembles the rest of the *Nectarinidæ;* it hovers about the flowers in search of their sweet juices and of the insects which conceal themselves among the petals, and also captures insects upon the branches of trees and shrubs. The nest is suspended at the extremity of a slender twig; it is constructed very artificially with straws and other coarse materials externally, and lined with soft matters, woven into the form of a chemist's retort with a neck about a foot long, through which the little architects obtain access to the true nest situated in the belly of the retort. Here the eggs are laid, and thus the brood and their parents are sheltered from their enemies.

THE CAYENNE DARNIS (*Darnis cayana*), another species abundant in Guiana, is rather more than four inches in length, and of a glossy green colour, streaked with white on the lower surface. It resides in the forests, and usually keeps in the upper parts of high trees, preferring those which are in flower. Here it creeps about in every direction upon the branches and twigs in search of spiders and insects, which appear to constitute at least the greater part of its nourishment. The nest is built at the top of lofty trees.

THE BLACK AND YELLOW CERTHIOLE (*Certhiola flaveola*) is an inhabitant of tropical South America and the West Indian islands, where it appears to be abundant. Its general colour is ashy-grey, but the head is blackish, with a white streak over each eye, united behind the head. The anterior part of the wings is margined with bright yellow, and the rump, breast, and abdomen are yellow, becoming greyish towards the vent. The length of the bird is about four inches and a half. The Certhiole is called the *Sucrier* in Cayenne, from its frequenting the sugar-canes for the sake of their sweet viscous juice; it also haunts flowers, partly in search of their nectar, but partly for the insects contained in them. It is said to have a short but agreeable song. During the greater part of the year it is a very solitary bird, and even during the breeding season usually endeavours to keep all its fellows from the place which it has selected for its dwelling. Its nest is suspended at the extremity of the most flexible twigs, and it usually selects those for this purpose which hang over the middle of a brook. The nest, which is exclusively the work of the female, is constructed of moss, dry vegetable fibres, and the cotton and down of plants. These materials are so closely interwoven, and so strongly attached to the supporting twig, that the whole must be broken to pieces if it be desired to remove it without cutting the twigs. The entrance is from below, and the nest is divided vertically by a partition into two chambers, one of which serves as a sort of staircase to enable the bird to ascend to the top of the nest, whence it then descends into the second chamber, which has no direct communication with the exterior. In this chamber the female lays her eggs and performs the business of incubation, sheltered from all her enemies; security is still further provided for by the male keeping watch in the outer chamber of this ingeniously-constructed dwelling. With this interesting species we may close our notice of the present family, and pass to that of the Humming-birds.

FAMILY III.—TROCHILIDÆ.

The birds forming this family, which are undoubtedly the gems of our ornithological treasuries, are peculiar to the New World, in the tropical parts of which they abound, adorning the gardens, fields, and woods, and even the mountain sides to a considerable height, with their swiftly glancing fairy-like forms, and brilliant sparkling colours. These charming little birds, the smallest, as a group, of all the feathered tribes, are furnished with a long and more or less acute bill, which is sometimes straight and sometimes curved, and has the lateral margins of its upper mandible dilated beyond the edges of the lower one. The nostrils are situated at the base of the upper mandible, and concealed beneath a large scale, which is sometimes covered with feathers. The wings are long and pointed, reminding one somewhat of those of the Swifts, with which, as already stated, the Humming-birds have a very manifest affinity. They are moved by powerful muscles, and the keel of the sternum, to which the great pectoral muscles are attached, is probably more developed in these than in any other birds. The structure of the sternum presents a very close general resemblance to that prevailing in the Swifts. The legs are short and slender, indicating that the birds are not in the habit of alighting on the ground; but the feet are terminated by long toes, well adapted for perching upon the twigs of trees and shrubs, which are the favourite resting-places of these feathered gems. The structure of the tongue and its accessories is very remarkable in the Humming-birds. The tongue itself is cleft nearly to its base; and the branches of the hyoid bone, which supports the tongue, are prolonged round the back of the skull almost like springs. By the agency of this remarkable organization, which, however, we shall meet with elsewhere amongst birds, the tongue acquires great capability of protrusion and retraction, so that it may work within the tubular bill like the piston of a pump; and the birds are said to use it in this way in sucking up the sweet juices of flowers, which certainly constitute a portion of their food, and have been regarded by many naturalists as forming nearly their whole nourishment. From the observations of modern ornithologists, however, there would appear to be no doubt that the Humming-birds are decidedly insectivorous, and that their principal object in visiting the flowers, about which they hover from morning till night, is to obtain the small beetles and other insects which abound amongst the petals. Hovering in the air with its wings in such rapid motion as to be quite invisible, or only apparent like a grey mist on each side of the bird, the little Humming-bird buries its long bill in the interior of a flower, and then protruding its forked tongue, which is said to be indued with a viscid secretion, it readily seizes the little beetles and other insects which are attracted by the nectar, and retracting its tongue, swallows them immediately. While thus occupied, the rapidly-vibrating wings produce a humming noise, whence the name applied to the birds. Some of the species do not depend wholly upon flowers for their supply of insect food, but have been observed capturing flies on the wing in the same way as the Flycatchers—namely, by taking up a post of observation upon the tip of a dead branch or twig, and flying off in pursuit of their prey as soon as it comes within sight. The males are described as very pugnacious in their habits, rarely meeting without a battle, when the vanquished bird is compelled to quit the field; and the victor returns to feast upon the flowers, for which he has fought so bravely. An immense number of species of these beautiful birds have been described; but of these we can only refer to comparatively very few. For further information upon their forms and habits, illustrated by the most life-like figures, the reader must consult Mr. Gould's magnificent work, the "Monograph of the Trochilidæ."

THE RUBY-THROATED HUMMING-BIRD (*Trochilus colubris*), one of the most widely-distributed species of this family, is a beautiful bird, of a rich golden-green colour above, and white, with a golden-green tinge beneath, except on the throat which is of the most brilliant ruby red; the wings and tail are purplish-brown, and the bill, eyes, and feet black. The female differs from the male in the absence of the brilliant crimson colour on the throat, and in having the tail feathers tipped with white. The total length of the bird is three inches and a half. Like many other Humming-birds, the Ruby-throat is migratory; but its wanderings extend to a far greater distance than those of any other species. It passes the winter in the warm regions of Central America, and about the month of March sets off on its migrations towards the north. In the course of this month it arrives in the southern states of the American Union, and thence gradually advances, reaching the latitude of New York generally in May. From the northern states it passes into Canada, and even visits the territories of Hudson's Bay Company. In all these districts it breeds, and in some places rears two broods in the year.

The nest, as described by Wilson, is generally fixed on the upper side of a horizontal branch, not among the twigs, but on the body of the branch itself. It is about an inch in diameter, composed externally of fragments of lichen glued on with a sort of saliva, within which is a thick layer of the wings of certain seeds; and the whole is lined with the fine down of the mullein and of the stalks of ferns. The base of the nest is continued round the branch, so that when viewed from below, it appears to be a mere mossy knob or protuberance. In some cases, it is built against the moss-grown trunk of an old tree, and occasionally upon the strong stem of some low growing plant. The eggs are two in number, and pure white. Tubular flowers constitute the favourite resort of this Humming-bird; and Wilson's description of his behaviour about a thicket of full-blown trumpet-flowers may be given here as an illustration of the habits of this bird. "He poises or suspends himself on wing," says Wilson, "for the space of two or three seconds, so steadily that his wings become invisible, or only like a mist; and you can plainly distinguish the pupil of his eye looking round with great quickness and circumspection. The glossy golden green of his back and the fire of his throat, dazzling in the sun, form altogether a most interesting appearance. When he alights, which he frequently does, he always prefers the small dead twigs of a tree or bush, where he dresses and arranges his plumage with great dexterity. His only note is a single chirp, not louder than that of a small cricket or grasshopper, generally uttered while passing from flower to flower, or when engaged in fight with his fellows; for when the males meet at the same bush or flower, a battle instantly takes place, and the combatants ascend in the air, chirping, darting, and circling round each other, till the eye is no longer able to follow them. The conqueror, however, generally returns to the place to reap the fruits of his victory." Mr. Gould, who saw great numbers of these birds at Washington, does not give them so pugnacious a character, and is inclined to think that it must be during the breeding season that the males are so quarrelsome. "The flight of the Humming-bird," says Wilson, "from flower to flower, greatly resembles that of a bee, but is so much more rapid, that the latter appears a mere loiterer to him. He poises himself on wing, while he thrusts his long, slender, tubular tongue into the flowers in search of food. He sometimes enters a room by the window, examines the bouquets of flowers, and passes out by the opposite door or window. He has been known to take refuge in a hothouse during the cool nights of autumn, to go regularly out in the morning, and to return as regularly in the evening, for several days together." The food of this species, according to Audubon, consists principally of insects, usually small beetles, which, with some equally diminutive flies, are commonly found in the stomach. The pugcity of the Humming-bird is displayed not only in combats with his own species; he will frequently attack the king bird and the martin with some degree of success; and an old French writer declared that he could drive his slender bill into the body of a crow with such vigour, as to bring even this gigantic opponent to the ground! A still more absurd notion, which we have seen published not long since, is, that the Humming-bird will overcome even the eagle by perching on his head and picking out the feathers from that part of the king of birds!

DE LALANDE'S CRESTED HUMMING-BIRD (*Trochilus Delalandi*)—Plate 8, fig. 26—is an inhabitant of the southern part of Brazil. It is about the same size as the preceding species, but the male is remarkable for possessing a long crest, terminating in a single slender plume, upon the head. The whole crown of the head, including the crest, is of a brilliant metallic green colour, but the long single feather terminating the crest is black. The upper surface is bronzed green; the breast and abdomen are of an intense shining violet-blue colour; the sides of the neck, the flanks, and under tail-coverts are brownish-grey; the quill feathers of the wings purplish-brown, and those of the tail black, except the middle ones, which are green. The female has the whole lower surface dull greyish-brown, and is destitute of the elongated crest. The nest of this species is suspended from the fine twigs of bamboos, and probably of other plants; it is composed of fine fibrous roots, moss, and lichens, together with the involucres of a composite plant, matted together with fine cobwebs. Several nearly allied species with similar crests are described by Mr. Gould, who forms them into a genus under the name of *Cephalepis;* they are called by him in English *Plover-crests,* from the similarity of the crest to that of the plover.

THE LONG-TAILED EMERALD HUMMING-BIRD (*Trochilus polytmus*) appears to be peculiar to the island of Jamaica, amongst the many brilliant-feathered inhabitants of which it is regarded by Mr. Gosse as the most beautiful. The general colour of the plumage of the male is a fine metallic green, most brilliant on the breast and abdomen; the whole top of the head is deep black, as is also the tail; the quill feathers of the wings and the under tail-coverts are purplish-black; and the bill is coral-red with a black tip. The length of the bird, from the tip of the bill to that of the ordinary tail feathers, is five inches; but beyond this two of the feathers of the tail are prolonged for a distance of nearly six inches, forming long streamers, which float behind the bird in its rapid flight. The female is destitute of these elongated feathers, and has the lower surface white. Of the beautiful appearance of this bird in its native haunts, Mr. Gosse has given us the following eloquent description:—"The beautiful Long-tailed Humming-bird," he says, "came shooting by with its two long violet-black feathers floating like streamers behind it, and began to suck at the blossoms of the tree in which I was. Quite regardless of my presence, consciously secure in its power of wing, the lovely little gem hovered around the trunk, and threaded the branches, now probing here and there, its cloudy wings on each side vibrating with a noise like that of a spinning-wheel, and its emerald breast for a moment flashing brilliantly in the sun's ray; then apparently black, all the light being absorbed; then, as it slightly turned, becoming a dark olive; then, in an instant, blazing forth again in emerald effulgence. Several times it came close to me, as I sat motionless with delight, and holding my breath for fear of alarming it and driving it away; it seemed almost worth a voyage across the sea to behold so radiant a creature in all the wildness of its native freedom."

THE TUFTED COQUETTE (*Lophornis ornatus*). The male of this beautiful little species is adorned on each side of the neck with a tuft of long, narrow plumes, of a light chestnut-red colour, each terminated by a brilliant spot of emerald green; these plumes form a triangular ruff on each side of the neck. The crown of the head bears a rich chestnut-red crest, and the face and throat are emerald green. This species is widely distributed over the low districts of tropical America.

GOULD'S COQUETTE (*Lophornis Gouldii*), a nearly allied but rare species, has the neck tufts pure white, with emerald green tips to the feathers. There are several other species of the genus *Lophornis,* but to these our space forbids our alluding.

THE RUBY AND TOPAZ HUMMING-BIRD (*Chrysolampis moschitus*), one of the commonest species of the group of Humming-birds, specimens of which are imported into Europe by thousands, is found abundantly in Brazil and Guiana. Common as it is, however, the male is an exceedingly beautiful bird, the whole top of his head being of a brilliant ruby-red, and the chin, throat, and breast golden or topaz yellow; the rest of the plumage exhibits different shades of brown, and the tail is of a rich dark chestnut-red. The nest is cup-shaped, composed of cottony materials, and adorned with fragments of lichens on the outside.

THE GIANT HUMMING-BIRD (*Patagona gigas*), the largest species of this family, measures between eight and nine inches in length; but as the tail is comparatively short, its bulk is far greater than that of some other species which approach it in total length, but in which the tail feathers are much elongated. It is of a pale brown colour with a greenish gloss above, and reddish beneath; the wings, which are very long, reaching nearly to the extremity of the tail, are blackish-brown. This species migrates to the southward from the equatorial regions of South America, where it has been met with at an elevation of from twelve to fourteen thousand feet, and passes along the chain of the Andes through Chili into the country of the Araucanos. Its flight is extremely bold and vigorous, as might be expected from the length and form of its wings, which resemble those of the Swift; but it is nevertheless able to flit with ease from flower to flower, and to poise itself in the air while examining their recesses for its insect food. The nest is cup-shaped, rather large, and constructed of mosses, lichens, and other similar materials, held together, as usual in the Humming-birds, by cobwebs; it is placed on the forked branch of a tree or shrub, generally overhanging a rapid stream of water.

THE GLOWING PUFF-LEG (*Eriocnemis vestitus*). The names of *Puff-leg* and *Eriocnemis* have been given to a genus of Humming-birds in which the legs are surrounded by a tuft of delicate small plumes, which are usually of a white colour. Of the present species Mr. Gould says, "It is unquestionably one of the finest species of its genus, and one of the most resplendent of the Trochilidæ." It is a native of Columbia, where it is found abundantly in the vicinity of Bogota. The general colour of the plumage in the male is bronzed green, varying in tint on different parts of the body; the lower part of the back, and the upper tail-coverts, which are largely developed, are of the most brilliant golden green; the abdomen is also golden green; a circular spot on the chin, and the lower tail-coverts, are metallic blue; the wings are purplish-brown, and the tail blue-black. The colouring of the female is very similar but less brilliant, and the snow-white tufts of feathers surrounding the legs are much smaller than in the male.

THE METALLIC PUFF-LEG (*Eriocnemis Alinæ*) is a smaller, but almost more brilliant species of this genus, the forehead and the whole lower surface of the body in the male being of the most splendid golden-green colour. The legs of the male are surrounded by very large tufts of snow-white feathers. It is an inhabitant of the vicinity of Bogota.

LORD DERBY'S PUFF-LEG (*Eriocnemis Derbianus*). This species, which has hitherto only been found upon the extinct volcano of Puracé in New Grenada, is remarkable amongst the Puff-legs for having the tufts of delicate feathers with which its legs are adorned, of a black colour. Its plumage is generally of a golden bronze hue, but the upper and under tail-coverts are of a brilliant golden green.

There are numerous other species of Puff-legs, but of these we can only notice that described under the name of *Eriocnemis Aureliæ*, in which the leg-tufts are white, tinged with chestnut-brown.

THE WHITE-BOOTED RACKET-TAIL (*Spathura Underwoodi*). Mr. Gould gives the name of Racket-tails to some elegant little species of Humming-birds allied to the Puff-legs, and like them furnished with tufts of delicate plumes surrounding the feet, but distinguished by having the outer tail feathers in the male much elongated, very slender for part of their length, and terminated by a broad palette. The present is a beautiful little species, measuring about three inches in length, exclusive of the long tail feathers, which are two inches and a half long. The general colour is bronzed green, becoming brilliant green on the throat of the male, and the leg-tufts or "boots" are white. This bird is found on the Columbian Andes, over a considerable space, but appears to be confined to the regions between five and nine thousand feet above the sea. When hovering before a flower, the motion of its wings is exceedingly rapid, and produces a loud humming, and the elongated tail feathers are very conspicuous. Two other species, the PERUVIAN and the RED-BOOTED RACKET-TAIL, have the leg-tufts reddish-buff.

THE LITTLE HERMIT (*Phaëtornis eremita*), a small species about four inches in length, is of a reddish-buff colour, with the head, neck, and back bronzed green, the wings deep purplish-brown, and the tail feathers bronzed brown, tinged with green, and tipped with deep buff; across the breast there is a black crescent-shaped mark. This species is found in Southern Brazil, where it appears to be abundant. Its nest is composed of various fine vegetable fibres held together by spider's web; it is in the form of a round deep cup, tapering into a long point at the bottom. It is ingeniously attached by means of cobweb to the extremity of a leaf, forming a most elegant cradle for the two young birds which are hatched from the delicate pink-white eggs.

THE CAYENNE HERMIT (*Phaëtornis superciliosus*), one of the commonest and best known of the Humming-birds, is abundant in Guiana, and also occurs in the northern provinces of Brazil. It measures rather more than seven inches in length, including the very long bill, which is about an inch and three quarters, and the two elongated middle tail feathers, which project nearly an inch beyond the rest of the tail. The latter character is common to nearly all the species of the genus *Phaëtornis*. This bird is of a bronzed brown colour on the upper surface, with a buff superciliary streak; there is also a buff streak beneath the eye; the lower surface is of a dusky fawn colour, passing to buff on the lower tail-coverts; the quill feathers of the wings are purplish-brown, and those of the tail bronzed green, becoming blackish towards the tip, where the lateral feathers are terminated by an arrow-shaped buff mark; the prolonged apical portion of the two middle feathers is white. The upper mandible is black, and the lower one reddish, with the tip black. There are numerous other species of the genus *Phaëtornis*, most of them remarkable for elegance of form, although none exhibit those brilliant metallic tints with which many other Humming-birds are adorned.

THE STELLA HUMMING-BIRD (*Oreotrochilus Estella*) is a beautiful species which is met with in the Bolivian Andes at a considerable elevation, specimens having been obtained at more than eleven thousand feet above the sea-level. The male is about five inches in length, and has the whole plumage of the upper parts greyish olive-brown, the lower surface white, with a somewhat triangular brown band occupying the centre of the abdomen, and a most brilliant golden-green patch on the throat, bounded behind by a crescent-shaped band of violet-black tinged with shining blue. The female is smaller than the male, and has the throat white, spotted with brown. From the great elevation at which this bird lives, specimens are rare in collections. It inhabits dry places, and is solitary in its habits, in other respects resembling the rest of its family —flitting about from flower to flower, and often resting upon the twigs of shrubs and trees. Its food consists of insects and the pollen of flowers.

THE WHITE-SIDED HILL-STAR (*Oreotrochilus leucopleurus*) resembles the preceding species, but has a large triangular black patch upon the abdomen. It is an inhabitant of the mountains of Chili, where it is met with abundantly at an elevation of ten thousand feet. The nest of this species is described by Mr. Gould as a dense and warm structure, composed of moss, fine vegetable substances, and feathers, and larger in proportion to the size of the bird than is usual in this family; it is attached by means of cobwebs to the side of a rock.

Several other species of the genus *Oreotrochilus* are described by Mr. Gould, but of these we can only notice two charming little birds, the CHIMBORAZIAN HILL-STAR (*O. Chimborazo*), and the PICHINCHA HILL-STAR (*O. Pichincha*)—the former an inhabitant of the high mountain Chimborazo, where it is found at an elevation of from twelve thousand to sixteen thousand feet, and the second at a somewhat lower altitude on Pichincha and Cotopaxi. Both these species are green, with the lower surface white, and the males have the head of a splendid blue colour; but in the Chimborazo species the throat is brilliant green, while in that from the Pichincha the azure tint of the head is continued down to the crescentic black band, which in both forms crosses below the throat.

THE SICKLE-BILLED HUMMING-BIRD (*Grypus Aquila*) is one of the most singular species of the family, from the remarkable structure of its bill, which is curved to such an extent as to resemble the agricultural implement referred to in the name of the species. The bill has the upper mandible black and the lower one yellow; the upper surface of the body is shining dark green, the lower surface blackish, streaked with buff on the throat and breast, and with white on the abdomen; the wings are purplish-brown, and the tail feathers green, tipped with white. It is one of the larger species, measuring about six inches in length. The specimens known are from Bogota and Central America. The bird is very rare in collections, and nothing is known of its habits.

THE SAW BILL (*Grypus nævius*). This species, which is found in Southern Brazil, especially on the mountains of Corcovado near Rio de Janeiro, is distinguished by having the margins of the mandibles serrated. It measures about six inches in length, including the rather long and ample tail, and is of a greenish bronze colour above, with the tail feathers tipped with buff; the feathers of the lower surface are blackish, broadly edged with white on the breast and with buff on the belly; the sides of the throat are reddish buff. The bill is black, with the base of the lower mandible yellow; and the feet are yellow. The nest of this species is of an elongated, pointed form, composed principally of moss and fine vegetable fibres; it is suspended from the extremity of a leaf.

THE SWALLOW-TAILED HUMMING-BIRD (*Eupetomena macrura*). This species, which is described by Mr. Gould as "the most swallow-like member of the entire family of Trochilidæ," is found in the low districts bordering the rivers of Brazil and Cayenne. The plumage of the body is green; the whole of the head and neck are rich shining blue, and the tail and tail-coverts are steel blue; on each side of the body there is a white tuft, and the vent is white. The tail is much elongated and forked in the male, less so in the female, which is also smaller and rather less brilliant than her partner.

THE PURPLE-BREASTED CARIB (*Eulampis jugularis*)—Plate 8, fig. 2—(*Trochilus granatinus*). This beautiful species is an inhabitant of the West Indies, and is said also to occur in Guiana. It frequents the high grounds. The sexes are exactly alike; the general colour of the plumage being black, with the chin, throat, and breast reddish-purple; the wings and wing-coverts shining green; the tail-coverts greatly developed and of a brilliant green; and the feathers of the broad and powerful tail blackish-green. This bird measures about five inches in length.

THE CRIMSON TOPAZ (*Topaza pella*), which must be regarded as one of the most gorgeous species of this splendid family, is an inhabitant of the low districts of Cayenne, Trinidad, and Surinam, and also of the countries bordering the lower Amazon. The male measures about six inches in length, exclusive of a pair of elongated tail feathers that are wanting in the female, which is also a little smaller than her mate. The whole of the back and wing-coverts in the male are deep rich red, becoming orange-red on the rump, and gradually giving place to bronzed green on the upper tail-coverts. The two centre tail feathers are also bronzed green; the next feather on each side is brownish-black, prolonged for a distance of about two inches and a half beyond the rest of the tail, and crossing each other, whilst the three outer feathers on each side are reddish-buff. The head is deep violet black, and from it a broad band passes down the sides of the neck and across the throat, inclosing a large space of the most brilliant golden-green colour, exhibiting a rich golden or topaz hue in the centre. The breast is occupied by a broad band of deep crimson, and the rest of the lower surface is of a brighter shining tint of the same colour. The legs are white, the feet yellow, and the bill black. The general colour of the female is bronzed green.

Mr. Waterton gives the following account of the habits of this magnificent bird:—"One species alone," he says, "never shows his beauty to the sun; and were it not for his lovely shining colours, you might almost be tempted to class him with the goatsuckers, on account of his habits. He is the largest of all the Humming-birds, and is all red and changing gold-green, except the head, which is black. He has two long feathers in the tail, which cross each other, and these have gained him the name of *Karabimiti*, or ARA HUMMING-BIRD, from the Indians. You never find him on the sea-coast, or where the river is salt, or in the heart of the forest, unless fresh water is there. He keeps close by the side of woody fresh-water rivers, and dark and lonely creeks. He leaves his retreat before sunrise, to feed on the insects near the water; he returns to it as soon as the sun's rays cause a glare of light, is sedentary all day long, and comes out again for a short time after sunset. He builds his nest on a twig over the water in the unfrequented creeks; it looks like tanned cow-leather." This nest, according to Mr. Gould, is of a deep cup-like form, with very thin walls, composed apparently of a sort of fungus resembling German tinder, and held together by cobwebs.

THE JACOBIN (*Florisuga mellivora*) is a very widely distributed species, occurring in all the low-lying districts from Guiana to Peru. It is liable to great diversity of colouring, but the ordinary plumage of the adult male is of a bronzed green colour above and white beneath, with the whole of the head and throat brilliant blue, and a white lunate mark on the back, behind the blue of the head. The upper tail-coverts are very large and long, reaching nearly to the extremity of the tail, and of the same bronzed green colour as the back; the tail feathers themselves are white, narrowly margined at the tip with black. The whole length of the bird is four inches and a half.

THE SHORT-TAILED WOODSTAR (*Calothorax macrurus*). This curious little bird is one of the most diminutive even in this family of dwarfs, measuring rather less than two inches and a half in length. The upper surface is bronzed green, the lower surface buff, and the wings purplish-brown. The male has a large triangular gorget of a brilliant amethyst red, which is represented in the female by a few specks of the same colour. The tail, in both sexes, is composed of exceedingly short feathers, which in the male are black and very narrow, so that when spread out they radiate like spokes round the posterior extremity of the body. In the female they are rather broader, and furnished with large white tips. This character of the tail is met with in other species of the genus *Calothorax*. The Short-tailed Woodstar is an inhabitant of Peru.

THE SWORD-BILL (*Docimastes ensiferus*) is remarkable for the great length of its bill, which is slightly curved upwards, and is employed by the bird in procuring its insect food from the enormously elongated tubular flowers of the trumpet-flowers (*Brugmansiæ*). The total length of the male is eight inches and three-quarters, of which the bill measures four inches; the female is about two inches shorter than her partner, and her bill only measures three inches in length. Its general colour is bronzed green, but it is not a brilliant species. This bird has been found in Bogota, Caraccas, and Quito. In the latter country specimens have been obtained at an elevation of eleven thousand to twelve thousand feet above the sea.

TEMMINCK'S SAPPHIRE-WING (*Pterophanes Temminckii*) is one of the finest species of this family, measuring fully six inches in length, whilst its plumage displays all the brilliancy which we are accustomed to associate with the idea of a Humming-bird. The male is of a grass-green colour, exhibiting a strong metallic lustre beneath; the tail, which is notched or slightly forked at the extremity, is of a glossy olive-green colour, whilst the quill feathers of the wings are of a shining deep blue, margined and tipped with black. The bill, which is rather short, slender, and straight, is black. The female resembles the male, but has the throat brown. This beautiful bird is found principally on the Cordillera of Columbia, where it dwells at a considerable elevation.

GUERIN'S HELMET-CREST (*Oxypogon Guerinii*), an inhabitant of the higher regions of the Columbian Andes, is remarkable for the singular crest with which the head of the male is adorned. The colour of the upper surface is bronzed green, with the tail feathers coppery, striped with white down the centre; the lower surface is light olive-brown, with a bronzed tinge on the flanks. The female is similar in these respects to the male, but less brilliant in her colours. The male is further distinguished by having a long, pointed crest on the head, the head and crest being blackish-brown, with a white line running up each side of the forehead, uniting at the base of the crest, and passing up the front of the latter in a single broad line. The sides of the throat are also brownish-black, but the middle of this part is occupied by a sort of pointed white beard, balancing the crest on the top of the head, but exhibiting a narrow band of the most brilliant green in the centre. The bill is rather short, slender, and black. The total length of the bird is about four inches and a half.

THE BLUE-TAILED SYLPH (*Cynanthus cyanurus*), one of the most elegant species of this family, is an inhabitant of the lower elevations of the Andes to the north of the equator, in the countries of Ecuador, New Grenada, and Venezuela. The male measures about nine inches in length, including the greatly-elongated tail feathers with which he is adorned, and which of themselves are nearly six inches long. These are the outer feathers; they are black at the base, and for the remainder of their length exhibit a rich, brilliant, metallic, purplish-blue colour. The rest of the tail feathers, which gradually diminish in length from the second on each side, are black at the base, becoming rich blue towards the tip, which bears a brilliant golden-green mark; the two central feathers are entirely golden-green. The crown of the head is also of a brilliant metallic-green colour, and the throat bears a small patch of shining blue; the general colour of the rest of the plumage is bronzed green, with the wings purplish-brown. This beautiful bird is said to be very swift in its movements, its flight being very rapid and powerful; and this, as remarked by Mr. Gould, is indicated by its general form and long forked tail. The female is far less brilliant than the male, and destitute of the very elongated tail-feathers.

THE GREEN-TAILED SYLPH (*Cynanthus smaragdicaudus*) is similar in many respects to the preceding, but exhibits no trace of blue in the tail. It is an inhabitant of Bolivia, and probably of a wide extent of the Peruvian Andes.

THE RED FLAME-BEARER (*Selasphorus rufus*). This elegant little species, like the Ruby-throated Humming-bird (*Trochilus colubris*), spreads itself over a vast range of latitude, passing the winter in Mexico, and advancing during the summer as far north as Nootka Sound, where it was observed in abundance by Captain Cook. In all its migrations it keeps strictly to the western side of the Rocky Mountains, and thus represents on the west coast of North America, the Ruby-throat of the eastern or Atlantic districts.

The male of this charming little species, which measures about three inches and a half in length, has the upper surface cinnamon-brown, including the tail feathers, which are of a lanceolate form, and tipped with dark brown; the wings are purplish-brown, with their coverts bronzed; the throat is adorned with a large triangular gorget of a most brilliant golden orange-red; the breast is white, and the rest of the lower surface cinnamon brown. In some males the back is of a green colour; and this is also the case in the females, which have the tail feathers black tipped with white, and in place of the brilliant gorget of the males, a fiery red spot on the tips of most of the feathers of the throat. The males are excessively quarrelsome during the breeding season, when their burnished gorgets look like a brilliant live-coal; and they emit a sort of bleating note which scarcely sounds like the cry of a bird. They often rise to a great height in the air, and then descend instantaneously almost to the surface of the ground; and during this descent, according to Dr. Townsend, they emit "a strange and astonishingly-loud note, which can be compared to nothing but the rubbing together of the limbs of trees during a high wind." The nest measures two inches and a quarter in height, and three quarters of an inch in breadth at the top; it is composed of mosses, lichens, and feathers, with a few slender root-fibres, and lined with the fine down of seeds. There are several other species of this genus—all exhibiting the same metallic brilliancy in their gorgets.

THE LITTLE HUMMING-BIRD (*Mellisuga minima*), which may be regarded as the smallest known species of this family, as it measures only about two inches and a half in length, is an inhabitant of Jamaica and St. Domingo. The male of this little feathered fairy has the upper parts dark shining green, the wings purplish-brown, and the tail black; the lower surface is white, speckled with black on the chin and throat, and tinged with green on the abdomen; the bill and feet are black. The female greatly resembles the male, but has the whole lower surface pure white, and the lateral tail feathers tipped with white. Of this species Mr. Gosse says—"The present is the only Humming-bird with which I am acquainted that has a real song. Soon after sunrise in the spring months, it is fond of sitting on the topmost twig of a mango or orange-tree, where it warbles in a very weak but very sweet tone, a continuous melody for ten minutes at a time. It has little variety. The others have only a pertinacious chirping." The charming writer just quoted also gives us the following graphic description of the manners of this diminutive creature:—"I have sometimes watched with great delight," he says, "the evolutions of this little species at a moringa-tree. When only one is present, he pursues the round of the blossoms soberly enough, sucking as he goes, and every now and anon, sitting quietly on a twig. But if two are about the tree, one will fly off, and, suspending himself in the air a few yards distant, the other presently shoots off to him, and there without touching each other, they mount upwards with a strong rushing of wings, perhaps for five hundred feet. They then separate, and each shoots diagonally towards the ground like a ball from a rifle, and, wheeling round, comes up to the blossoms again, and sucks, and sucks, as if it had not moved away at all. Frequently one alone will mount in this manner, or dart on invisible wing diagonally upward, looking exactly like a Humble bee." Mr. Gosse also states that this is the only Jamaican Humming-bird that haunts the low growing plants of the pastures; he says it is exceedingly partial to the West Indian Vervain (*Stachytarpheta*). The nest is a minute cup-shaped structure placed upon or between the twigs of trees, &c.; it is composed of silk cotton (the down of the *Bombax*), and ornamented externally with fragments of lichen.

FAMILY IV.—MELIPHAGIDÆ.

Just as the Humming-birds are confined to the continent of America and its islands, the small flower-haunting birds of the present family are peculiar to Australia, a very few species only being met with elsewhere, and these only in New Guinea and New Zealand—countries, which, in so many cases, appear to harbour the outlying members of truly Australian groups.

The *Meliphagidæ* or *Honey-eaters* have usually a long, curved, and acute bill, of which the upper mandible is generally notched faintly at the tip; the nostrils are placed in a large groove, and usually covered with a membranous scale; the tail is elongated, and wedge-shaped, and the first three quills of the rather short wings are graduated; that is, they gradually increase in length to the third; the tarsi are short and stout, and terminated by long toes, of which the outer is always united to the middle one at the base. Another character presented by these birds consists in the structure of the tongue, which is not only long and protrusible as in the Humming-birds, but furnished at its tip with a small tuft or brush of delicate filaments, which are of the greatest service to the birds in sweeping out the honey and pollen, and with these the minute beetles and other insects from the flowers, which they so assiduously frequent. These substances constitute the food of nearly all the species, although some also capture insects from the leaves and branches of trees, and a few are said to feed partly upon fruits. Few of them possess any power of song.

THE NEW HOLLAND HONEY-EATER (*Meliphaga Novæ Hollandiæ*), the type of the typical genus of this family, is one of the most abundant birds in the southern and eastern colonies of Australia and in Van Diemen's Land, but does not occur in Western Australia. It is not migratory, but appears occasionally to quit one district for another, probably in search of some more attractive food; but from its partiality for the *Banksiæ*, which grow principally on barren sandy districts bordering the coasts, it is usually seen most abundantly in the vicinity of the sea, and becomes more rare in the interior of the country. The total length of this bird is about seven inches. The upper surface is brownish-black, the lower surface white streaked with black; the head and cheeks are black, with the forehead, a streak over each eye, and a small patch behind the ears white; the quill feathers of the wings and the lateral feathers of the tail are broadly margined externally, from the base to near the tip, with bright yellow; the two centre feathers of the tail are entirely brownish-black; the remainder have a white spot at the tip. This bird breeds commonly in the gardens of the colonists, and rears two or three broods in the season. The nest is usually placed in a shrub or bush at about eighteen inches or two feet from the ground; it is composed of sticks, grass, and bark, and lined with vegetable downy matter. The eggs are two or three in number, of a pale buff colour, and speckled with chestnut brown, especially towards the larger end.

THE LONG-BILLED HONEY-EATER (*Meliphaga longirostris*). This species, which very closely resembles the preceding, and indeed differs from it principally in the greater length and stoutness of the bill, replaces it in the western parts of the Australian continent, being found, according to Mr. Gould, in "all those districts of the Swan River settlement in which there are Banksias." The habits of the two birds are very similar. Two other nearly allied species, the WHITE-CHEEKED and the MOUSTACHED HONEY-EATER (*M. sericea* and *mystacalis*), are in like manner mutually representative in eastern and western Australia, the former being found in New South Wales, and the latter in the Swan River district.

THE TASMANIAN HONEY-EATER (*Meliphaga australasiana*), a small species about five inches and a half in length, appears to be peculiar to Van Diemen's Land, although a very similar bird, which may be identical with it, occurs also in New South Wales. The sexes differ considerably in colouring, which is very unusual amongst the *Meliphagæ*. The male has all the upper surface blackish, and the lower surface white, with the flanks grey; a black stripe runs from the base of the bill through the eye, and is continued along the side of the head, where it is bordered above by a white streak; on each side of the neck is a broad, black, crescentiform mark, the points of which nearly meet on the breast; the quill feathers of the wings and tail are margined with golden yellow, and the latter are tipped with white spots. The female is of a dusky brown colour, with scarcely any indication of the yellow tinge on the wings and tail.

"This," says Mr. Gould, "is one of the few species that enliven with their presence the almost impenetrable forests that cover a great portion of Van Diemen's Land, giving preference to such parts as are clothed with a thick brush of dwarf shrubby trees growing beneath the more lofty gums. The extreme silence of these solitudes is agreeably broken by the loud, shrill, and liquid notes which are poured forth in quick succession by numbers of this bird in various parts of the wood. It also resorts to the thick beds of the *Epacris impressa*, whose red and white heath-like flowers bespangle the sides of the more open hills. The blossoms of this beautiful plant afford it an abundant supply of food, which it seeks so intently as to admit of a sufficiently close approach to enable one to observe its actions without disturbing it. While thus occupied it may be seen clinging to the stems in every possible attitude, inserting its slender brush-like tongue up the tube of every floret with amazing rapidity. Independently of honey, it feeds on insects of various kinds, particularly those of the orders *Diptera* and *Hymenoptera*." "The nest," says the same distinguished ornithologist, "is always placed on a low shrub within a foot or two of the ground; it is of a round, open form, and is outwardly constructed of the inner rind of the stringy bark of the gum-tree, generally lined with fine grasses." The birds rear two or three broods during the season, which lasts from September to January. In the first laying the female produces two eggs, whilst later in the season, when insects are more abundant, three eggs are almost always found in the nest.

THE WARTY-FACED HONEY-EATER (*Xanthomyza phrygia*) is one of the handsomest of the smaller Australian birds, its black and yellow plumage presenting a remarkable contrast. The feathers of the upper surface are for the most part black, margined with yellow; those of the lower surface yellow, bordered with black, and with a more or less distinct blackish mark in the centre of each; the head, neck, and throat are black, with a yellow patch surrounding each eye; this, in the male is bare of feathers, and covered with warty excrescences. The male is about eight inches in length, and the female seven. It is not uncommon in South Australia and New South Wales, inhabiting the bushes, and evincing a decided partiality for the *Eucalypti*, the honey of which seems to form a great portion of its food, although, as Mr. Gould remarks, insects are doubtless eaten by it. Its note is a loud whistle.

THE YELLOW-EARED HONEY-EATER (*Ptilotis chrysotis*). This bird is between seven and eight inches in length, and is of an olive-green colour, paler beneath; each eye is inclosed in a blackish patch, behind which is a large oval spot of yellow; the bill is black, with the gape margined with white. It appears to be peculiar to New South Wales, in which colony it is very abundant, especially about the Hunter River, and in the cedar-brushes of the hills. Low trees are its favourite resort, and amongst these it frequently descends to the ground in search of insects, upon which it feeds; the pollen of flowers, and occasionally fruits and berries, also forming part of its diet. Its note is loud and ringing. The nest is cup-shaped, and composed of sticks and fine twigs; the eggs are four in number, white, and spotted with purplish-brown.

THE SINGING HONEY-EATER (*Ptilotis sonorus*), a species nearly allied to the preceding, has a fine song, described as resembling that of the missel-thrush. It is of a greyish-olive colour, paler beneath, with dusky streaks; a black band runs through the eye, and beneath it is a yellow streak; the quill feathers of the wings and tail are bordered externally with greenish-yellow. The nest is suspended between two or three slender twigs; it is composed of vegetable fibres of different kinds, hair, and the down of plants. Mr. Gould describes numerous other species of this genus, which is peculiar to Australia and New Guinea; their habits, as far as is known, are all very similar to those described above.

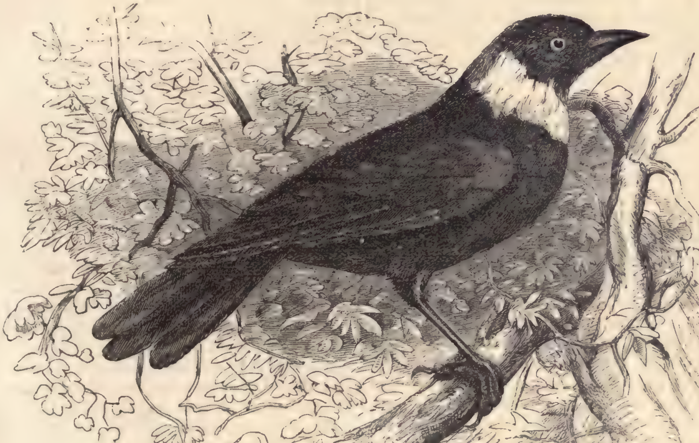
THE LONG-EARED WATTLE-BIRD (*Anthochæra inauris*). This singular species, which is of large size for this family, the male measuring nearly eighteen inches in length, is distinguished by a pair of long, yellow and orange pendants hanging down from the ears. In the male these curious appendages are about an inch and three-quarters in length; in the female they are half an inch shorter. The plumage is varied with blackish-brown, white, and grey, the upper surface being darkest; the head, neck, and lower surface grey, streaked with black, with the exception of the centre of the abdomen, which is yellow; the tail is very long—fully eight inches in the male—of a narrow wedge-shape, slightly notched at the tip, where the grey central feathers are narrowly tipped with white. The next pair of feathers are about an inch shorter than the middle ones, and each succeeding pair also diminishes in about the same ratio, these being blackish-brown with large white spots at the tip; and the whole being brought together on the lower surface of the tail, form a series of transverse black and white bands, the latter deeply notched behind.

These birds inhabit the forests of Van Diemen's Land, where they exist in great numbers; and in the neighbourhood of the Macquarrie Plains, many hundreds are shot and sent into Hobart Town, where they are highly prized for the table. In the winter they become exceedingly fat, and Mr. Gould states that a large cupful of oil may then be obtained from two of them; this is burnt, and gives an excellent light. The food of the species consists principally of the pollen and honey of the *Eucalypti*, although traces of insect food are sometimes detected in its stomach. It is active and sociable in its habits, forty or fifty being sometimes seen on a single tree. Its flight is short, and much resembles that of the common magpie. Its note is a harsh and disagreeable scream. The nest is cup-shaped, and composed of fine twigs, grass, and wool.

THE SHORT-EARED WATTLE-BIRD (*Anthochæra carunculata*), a nearly allied species, has been met with in all the southern parts of Australia, but not in Van Diemen's Land. Its general colour is greyish-brown, varied with pale grey; the tail is wedge-shaped, but broader than in the preceding species; underneath the eye is a large white patch, and from the posterior part of the lower margin of this depends a small bright red appendage about half an inch long. The whole length of the bird is about fourteen inches. In its habits, food, and note it resembles the preceding species.

THE BRUSH WATTLE-BIRD (*Anthochæra mellivora*) —called *Goo-gwar-ruck*, in imitation of its singular cry, by the natives of New South Wales—is an abundant and well-known species, not only in that colony, but also in South Australia and Van Diemen's Land. It is a smaller species than either of the preceding, measuring only about a foot in length; its general colour is dark brown, variously streaked and spotted with white. Both sexes are destitute of the curious wattles with which the preceding species are adorned. The Brush Wattle-bird is peculiarly attached to the *Banksias*, the flowers of which it explores as they open, in search of honey and insects. Mr. Gould remarks that as these trees are always indicative of barren land, the harsh note of this garrulous bird may generally be taken by the settler as a warning that the soil in the neighbourhood is not very fertile. It is a bold, animated, and pugnacious bird. The nest is rather small, placed upon a forked branch not far from the ground, and composed of fine twigs and fibres. The eggs are of a salmon colour, blotched with chestnut-brown, especially at the larger end; the nest usually contains two, sometimes three of them. This species is represented in Western Australia by the LUNULATED WATTLE-BIRD (*Anthochæra lunulata*).

Fig. 107.



The Poe-bird (Prosthemadera Novæ Zelandiæ).

THE POE-BIRD (*Prosthemadera Novæ Zelandiæ*)—fig. 107—one of the most abundant birds of New Zealand, is about the size of a thrush, and of a black colour, with a curious tuft of white feathers on each side of the neck, whence the name of the "Parson bird" has been given to it by the European settlers. Its native name is *Tui.* It possesses a wonderful talent for imitation, exactly mimicking the notes of all the other feathered inhabitants of the woods; hence it is some times called the Mocking Bird. In confinement it will also learn to imitate other sounds, such as the noises of dogs, cats, poultry, &c., and will soon speak long sentences with great correctness. The food of this bird consists principally of insects, in search of which it exhibits an incessant restless activity; it also feeds upon berries and earthworms. Its flesh is considered delicious.

THE FRIAR-BIRD (*Tropidorhynchus corniculatus*). The singular bird to which this name is given, has the head covered with a naked black skin, and the base of the bill adorned with a remarkable knob; the plumage of the upper surface is greyish-brown; that of the lower surface greyish, except the chin, throat, and chest, which are covered with lanceolate silver-white feathers. The length of the bird is about a foot. It is an exceedingly abundant and well-known bird in New South Wales, where its singular appearance, and no less singular notes, have obtained for it from the colonists a great variety of names; such as Friar-bird, Monk, and Leatherhead from the former, and Poor Soldier, Pimlico, and Four o'clock, from the latter. The topmost dead branches of lofty trees are usually selected by it for the exhibition of its vocal powers, and by this means it attracts more than an ordinary share of attention. It is very active among the branches, being able to cling in almost any position; its flight also is powerful, and during the breeding-season it manifests great boldness and pugnacity, driving all other birds to a distance from its nest. The nest is large and rather wide, cup-shaped, and composed externally of strips of bark and wool, followed by fine twigs and lined with grasses and fine fibres; the eggs are usually three in number, of a pale salmon colour, with minute darker specks. Mr. Gould describes several other species of this genus, found in different parts of Australia, but none of these call for special notice here.

THE BLUE-EYE (*Entomyza cyanotis*). This, which is one of the largest and most beautiful species of the present family, has only been met with in New South Wales, where, however, it is very abundant. It measures rather more than a foot in length; the plumage of the upper surface is of a golden olive colour, and that of the lower surface white; the head is black, with a large brilliant blue and green spot surrounding the eye, and there is a crescent-shaped white mark on the back of the head; the throat and centre of the chest are also black, leaving a continuous white stripe on each side.

With regard to this species, Mr. Gould says: "I have frequently seen eight or ten of these bold and spirited birds, with numerous other small honey-eaters and parakeets, on a single tree, displaying the most elegant and easy movements, clinging and hanging in every variety of position; frequently at the extreme ends of the small, thickly-flowered branches, bending them down with their weight. They may, however, be easily distinguished from the other birds with which they are in company, by their superior size, the brilliancy of their blue face, and the contrasted colours of their plumage; they are rendered equally conspicuous by the pugnacity with which they chase and drive about the other species resorting to the same tree. Mr. Gould states that this bird makes use of the large dome-shaped nest of a species of *Pomatorhinus*, laying its eggs not within the nest, but in a depression on the top.

THE BLACK HONEY-EATER (*Myzomela nigra*) is a widely-distributed species in the interior of Australia, where it feeds partly upon the honey and pollen of flowers, but principally upon insects which it captures both about the flowers and on the leaves and branches of the trees frequented by it. It measures about four inches and a half in length. The male is of a black colour with the abdomen white, marked with a black stripe down the centre; the female is brown above, with the lower surface brownish-white. The flight of this bird is very quick, and the male has a weak plaintive song. The nest is a neat cup-shaped structure composed of dried grass.

THE RED-HEADED HONEY-EATER (*Myzomela erythrocephala*). The male of this beautiful little species is blackish-brown, with the head and rump scarlet; the female is of a sober brown colour, paler beneath. It is met with in the northern parts of Australia, where it inhabits the mangrove-swamps on the creeks and inlets of the sea. It is an active chirping species.

THE SANGUINEOUS HONEY-EATER (*Myzomela sanguinolenta*) is another brilliant little bird, the male being scarlet, with the wings and tail black; the female is brown. This species inhabits the bushes of New South Wales, and feeds on insects and the pollen of flowers.

THE TAWNY-FRONTED HONEY-EATER (*Glyciphila fulvifrons*). This bird is met with in all the southern parts of Australia, and also in Van Diemen's Land, and the islands in Bass's Straits. It measures from five inches to five inches and a half in length; the female being, as usual in this family, rather smaller than her partner. The back is brown, the forehead tawny, the throat and abdomen white; a blackish band runs from the base of the bill down the sides of the neck, inclosing the eye. This species inhabits stony districts, and flies very rapidly, often ascending to a great height in the air. Its nest is built in a bush, of a cup-like form, composed of grass, and usually lined with the down of the *Zamia*, sometimes mixed with sheep's wool and other soft materials. The eggs are usually two, of a white colour, commonly blotched with chestnut. The food of the bird consists of the pollen of flowers and insects, and its song is described by Mr. Gould as commencing with a single note slowly drawn out and followed by a quick repetition of double notes, uttered six or eight times in succession. Several other species of the genus *Glyciphila* are met with in Australia.

THE PAINTED HONEY-EATER (*Entomophila picta*) is a pretty little species peculiar to the interior of New South Wales, where it lives amongst the trees bordering the plains of that part of Australia. It is an active bird, and frequently captures insects on the wing in the manner of the Flycatchers, by dashing off in pursuit of them and returning again to the same perch. It is of a black colour above, with a white spot behind each ear, and with the outer margins of the quill feathers rich yellow; the lower surface is white, with faint brown spots on the flanks. The bill is red, and the feet blackish. The length of the bird is nearly six inches.

THE LUNULATED HONEY-EATER (*Melithreptus lunulatus*). This small species, which, with the following, belongs to a group distinguished from the preceding Honey-eaters by the possession of a shorter and more conical bill, is abundant in the south-eastern districts of Australia, where it is found principally about the *Eucalypti* and *Angophoræ*. It measures nearly five inches in length, and is of a greenish-olive colour above, and pure white beneath; the head, back of the neck, and chin are black, with a naked scarlet space above each eye, and a pure white crescent on the back of the head. Its nest is cup-shaped and composed of strips of bark mixed with wool and hair, and lined with the fur of the Australian opossums; it is suspended by the edge to the slender twigs of the upper parts of trees. The eggs are two in number, pale buff, speckled with reddish-brown. A very similar but larger species, in which the naked space above the eye is pale green or yellow, inhabits Western Australia; it is described by Mr. Gould under the name of the SWAN RIVER HONEY-EATER (*M. chloropsis.*)

THE BLACKHEADED HONEY-EATER (*Melithreptus melanocephalus*), which is also very similar to the preceding, is destitute of the white crescent on the back of the head, and has a black mark on each side of the chest. The naked space above the eye is white, with a slight greenish tinge. This bird appears to be peculiar to Van Diemen's Land, where it is very abundant and shows a decided preference for the *Eucalypti*. It feeds on insects, the pollen and honey of flowers, and on fruit.

THE GARRULOUS HONEY-EATER (*Myzantha garrula*), an inhabitant of New South Wales, South Australia, and Van Diemen's Land, is a much larger species than the preceding, measuring between ten and eleven inches in length. Its general colour is greyish, paler beneath; the crown of the head and ear-coverts are black; there is a naked yellow spot behind each eye, and the bill and feet are yellow. The wings are also tinged with yellow. It inhabits thinly-timbered districts, and is of so restless and inquisitive a disposition that it becomes a perfect nuisance to the traveller through its haunts. "No sooner," says Mr. Gould, "does the hunter come within the precincts of its abode than the whole troop assemble round him and perform the most grotesque actions, spreading out their wings and tail, hanging from the branches in every possible variety of position, and sometimes suspended by one leg, keeping up all the time one incessant babbling note. Were this only momentary, or for a short time, their droll attitudes and singular note would be rather amusing than otherwise; but when they follow you through the entire forest, leaping and flying from branch to branch, and almost buffeting the dogs, they become very troublesome and annoying, awakening, as they do, the suspicions of the other animals of which you are in pursuit." The food of this species resembles that of the other Honey-eaters, but it appears to capture many insects on trees and on the ground.

Other nearly-allied species inhabit different parts of Australia, such as the SOMBRE HONEY-EATER (*M. obscura*) in Swan River, and the LUTEOUS HONEY-EATER (*M. lutea*) in Northern Australia.

THE BELL-BIRD (*Myzantha melanophrys*) is an inhabitant of New South Wales, where it dwells in the swampy bushes. Its habits resemble those of the Garrulous Honey-eater, and it is also a noisy bird. The appellation of "Bell-bird," given to it by the colonists, refers to a peculiar, faint, tinkling sound uttered by the bird, and which is compared to that of distant sheep-bells. This note is heard with delight by the traveller, as an indication that water is at hand. The Bell-bird is rather more than seven inches in length, and of a general yellowish-olive colour, with the lower surface paler than the upper, and with a blackish-brown tinge on the wings; the head has a black spot at the base of the lower mandible, a black ring round the eye, a yellow spot in front of the eye, and a red one behind it.

FAMILY V.—CERTHIADÆ.

This, which is the last family of the tenuirostral section of the passerine birds, includes a great variety of forms, and many of them make a very close approach in their characters to the more slender-billed forms of the next group; but the tip of the upper mandible is almost always destitute of the notch or tooth, which is characteristic of the dentirostral birds. The bill is generally elongated; but, in this respect, the birds vary greatly, as also in the degree of curvation of the bill, which, however, is usually but small. The tip of the upper mandible is generally acute. The nostrils are situated at the base of the bill, where they lie in a small groove, and are covered by a membranous scale. The structure of the feet varies greatly in this family; but the tarsi are generally short, and the toes long and armed with strong, curved claws. This is especially the case in the typical species, which are organized for running upon the trunks and branches of trees in search of the insects which constitute their food. These are commonly known as *creepers*, and their movements and general aspect, when engaged in the search for food, are so like those of small mammals, that, at the first glance, they might easily be mistaken for some small species of mice. These birds possess the power of singing, which is exerted by some species in a very pleasing manner. They are distributed in all parts of the world.

THE COMMON BROWN CREEPER (*Certhia familiaris*) — Plate 9, fig. 28—which is one of the few species of this family found in Britain, may be taken as the type of the group. It is a small bird, measuring only a little more than five inches in length; and from this and its general dull brown colour, coupled with its shy and retiring habits, although a common British bird it is comparatively rarely seen. This species occurs in all parts of Europe, but becomes rare in Russia and Northern Asia; it is, however, a well-known bird in North America, where it is known as the Brown Creeper. Its favourite haunts are woods, plantations, and parks, where it may be seen running in every direction over the bark of trees, searching in the crevices for its insect prey, and after completing its examination of one tree, flying off to repeat the process on the next. It is fond of passing rapidly in this way from tree to tree, and for this reason often haunts avenues. While thus engaged, its activity in running about upon the rough bark is astonishing; and if alarmed, it vanishes in an instant, passing round the trunk of the tree with the greatest ease, so as to place an effectual barrier between itself and the apprehended danger. In all these climbing operations the long, curved, and acute claws with which its toes are armed, are greatly assisted by the elongated and stiff feathers of the tail, of which the tips are more or less worn away.

The nest of the Common Creeper is made in the hollow of a tree; and for this purpose it usually selects a hole which has a very small external aperture, so as to prevent its enemies from getting access to its concealed treasures. Sometimes, however, it builds a regular nest attached to the inner surface of the loosened bark of a tree; one of these nests, described by Mr. Yarrell, consisted of small twigs, lined with a thick layer of fine grass, mixed with wool and feathers. The Creeper lays from seven to nine eggs of a white colour, with a few pale-red spots; it breeds as early as the month of April.

THE WALL-CREEPER (*Tichodroma muraria*)—Plate 9, fig. 29—is another European species, nearly related to the Common Creeper, which it much resembles in its habits, except that, instead of the trunks and branches of trees, it frequents the bare rocks of mountainous districts, seeking its insect food in their crevices, and breeding in the small cavities which abound among them. It is about seven inches in length, and has a longer bill and a shorter tail than the Common Creeper; the general colour of its plumage is ashy-grey, becoming blackish in particular parts; the cheeks and throat, the quill feathers of the wings and tail are black, the wings spotted, and the tail feathers tipped with white or ash colour; the wing-coverts are red. This bird is an inhabitant of the mountainous parts of Southern Europe, and is also found in Asia, but does not occur in Britain. During the summer it resides high up on the mountains, obtaining its supplies of food by running about upon the faces of the rocks; but in the winter it descends to a level inhabited by man, when it deserves its name of Wall-creeper, by the preference which it shows for running upon those old walls clothed with lichens, which doubtless furnish it with a supply of food most like that of its summer home among the mountains.

THE AUSTRALIAN BROWN TREE-CREEPER (*Climacteris scandens*). The Creepers are represented in Australia by a peculiar genus to which the name of *Climacteris* has been given. The Brown Tree-creeper is an inhabitant of all the south-eastern part of the Australian continent, where it resides principally in the open, thinly-timbered parts of the forest, seeking its insect food, not only amongst the cracks and crevices of the bark, but also in the hollow spouts, and even on the ground beneath the trees. In the latter situation it passes much time, moving about with pert, lively actions. Its flight is effected by a skimming motion of the wings.

The whole length of this bird is about six inches, and its plumage exhibits various shades of brown, with a broad buff band across the wings. The nest is composed of the hair of opossums; and Mr. Gould says that, judging from its brightness and freshness, this material is no doubt plucked from the living animals, while reposing in hollow trees. It is usually placed low down in a hollow branch, and contains two pale-reddish eggs which are blotched with reddish-brown.

THE RED TREE-CREEPER (*Climacteris rufa*) represents the preceding species in Western Australia, and resembles it precisely in its habits. It is dark brown above and reddish beneath. The nest is placed in the same situation as that of the last species, but composed of grasses, down, and feathers. There are several other species.

THE NUTHATCH (*Sitta europæa*)—Plate, 9, fig. 30—has a stouter and straighter bill than the preceding species, and its toes are remarkably long and slender, and terminated by very long, compressed, and curved claws. It is a small bird, measuring little more than five inches and a half in length, to the extremity of the short tail. The general colour of the plumage on the upper parts is bluish-grey, and that of the lower surface light reddish-yellow; the flanks are brownish, and the cheeks and throat white, this white portion being separated from the grey of the upper surface of the head and neck by a black band, which runs from the base of the bill to the shoulder.

The Nuthatch is a common bird in many parts of Europe, especially in the south. It is generally diffused in England, although not very abundant; its occurrence in Scotland is doubtful, and it has not been observed in Ireland. It is a brisk and lively bird; and its actions are very amusing, as it runs about quickly like the Creeper on the rough bark of its favourite trees. In this its tail does not afford it any assistance, and it is principally by the agency of its long and powerful curved claws that it maintains itself in ever-varying attitude on the trees; but the tarsus also comes into play, being applied to the surface in the manner of a footsole. The food of the bird consists partly of insects, caterpillars, and other animal matters, and partly of beech-mast and nuts; and it is from its predilection for the latter, and the peculiar mode in which it contrives to crack them, that its name of Nuthatch has been given to it. The nut is fixed by the bird in a crevice in the bark of a tree; he then moves round it as if to select the best point of attack; and, having taken up his position, and secured himself firmly by the grasp of his powerful feet, he proceeds to batter upon the nut with his strong bill, and soon breaks through the hardest shell.

This interesting bird is a permanent resident in this country, frequenting woods, plantations, parks, and even gardens and orchards; resorting to the latter principally on the approach of winter. It nestles in the holes of trees, making a bed of dead leaves, moss, and fragments of bark and wood, and usually taking the precaution of plastering up a portion of the external aperture of its abode with clay, so as to leave only a sufficient space to serve for its own passage. The object of this proceeding is evidently to prevent the Woodpeckers, which also breed in the holes of trees, from destroying the nest and taking possession of it. The Nuthatch lays six or seven eggs of a white colour spotted with rusty red; and the bird sits upon these with such pertinacity, that, as Montagu observes, "no persecution will force it to quit them. It defends its nest to the last extremity, strikes at the invader with its bill and wings, and makes a hissing noise; and after every effort of defence, will suffer itself to be taken in the hand rather than quit." Young birds taken from the nest may be easily tamed; but the old birds generally kill themselves by their efforts to escape. A second species of Nuthatch occurs in Eastern Europe, and several others in various parts of India, principally in the hilly districts. Other species are found in North America, amongst which we may notice—

THE CAROLINA NUTHATCH (*Sitta carolinensis*), which is an abundant species almost everywhere in North America, and presents a close resemblance to the European Nuthatch in its habits, differing principally in appearance in the black colour of the head, neck, and shoulders, and the white colour of the breast and belly. This species runs about upon trees in all positions just in the same way as our common Nuthatch, and like it rests and roosts with the head downwards. It also breeds in the holes of trees and fences. Its food consists of insects, spiders, &c., but it probably also feeds partly, like its European congener, upon nuts.

THE CANADIAN NUTHATCH (*Sitta canadensis*) is a smaller species than either of the preceding, measuring only four inches and a half in length. It is easily distinguished by the crown of the head being black, bounded by a white stripe, below which is a black line passing through the eye; the lower surface is rust colour. This bird is migratory in its habits, passing the winter in the southern states of the American Union, and visiting the more northern parts of the continent only in the summer for the purpose of breeding. It is more restless and rapid in its movements than even the preceding species, which it resembles in its general habits.

THE ORANGE-WINGED NUTHATCH (*Sittella chrysoptera*) is an inhabitant of the south-eastern part of the Australian continent. In its habits it closely resembles the European Nuthatch. This bird measures about four inches and a half in length; the upper surface is grey, with the top of the head dark brown, and a streak of brown down each feather of the back; the wings are dark brown, with a large red patch about the middle; the tail is black, with the tips of the outer feathers white; and the whole lower surface is greyish-white, with brown spots on the inferior tail-coverts.

Several nearly allied species occur in various parts of Australia, amongst which we need only mention

THE BLACK-CAPPED NUTHATCH (*Sittella pileata*), which occurs principally in Western Australia, and is one of the most active and elegant of the whole. It is easily distinguished by its deep black crown, and in the female this blackness extends over the whole top of the head, whilst in the male the forehead, and the whole of the space around the eyes, are white.

THE SPINE-TAILED ORTHONYX (*Orthonyx spinicaudus*), a large species, rather more than eight inches in length, has the shafts of the tail feathers prolonged beyond the webs, forming, as indicated by the name, a set of spines at the apex of the tail. This bird is found in the most retired spots in the bushes skirting the coast of the south-eastern angle of Australia; here it is seen running over the fallen trunks of trees, mossy stones, &c., in search of the insects (principally beetles) which constitute its food. The plumage of the upper surface is brown, with a black mark on each feather; the rump and upper tail-coverts reddish-brown without spots; the wings are black with greyish transverse bars, and the tail is black; the lower surface is greyish-white, with the throat rusty-red in the male, white in the female, and bordered on each side with a crescent-shaped deep black mark.

THE CAYENNE TREE CREEPER (*Dendrocolaptes cayanensis*). The place of the true Creepers and Nuthatches is taken in South America by a small group of birds of which the genus *Dendrocolaptes* is the type. In their habits these birds resemble the Creepers; they live solitary or in pairs in the woods and forests, creeping upon the trunks and branches of the trees. They are said to prefer dead trees, probably on account of the great quantities of insects and their larvæ which they find in them; these constitute their principal nourishment. They nestle in the holes of trees, depositing their eggs upon the dust of decayed wood lining the bottom of the hollow which they have selected. The Cayenne Tree Creeper, which is one of the best known species, inhabits the forests of Guiana and Brazil. It has a rather long, slightly curved, and robust bill, and a broad rounded tail; its length is about two inches, and its general colour is tawny above, pale yellowish beneath, most of the feathers having a whitish longitudinal streak. The bill and legs are black.

THE BRAZILIAN SABRE-BILL (*Xiphorhynchus procurvus*). Most of the species of *Dendrocolaptes* and the allied genera have a rather stout and but slightly curved bill, but in the present species, and a few nearly related to it, the bill is of great length, and so much arched that its summit rises as high as the level of the crown of the bird's head. In the present species, which is about the size of a blackbird, the bill is nearly two inches long; the general colour of the plumage is a cinnamon-brown, passing into reddish-grey upon the head and lower surface; the head and neck are covered with white streaks; and the tail feathers are terminated by very short naked points. By the agency of this stiff tail, and of its strong feet, the Sabre-bill creeps upon the trunks of palm-trees, and supports itself in an upright position, while its long and curved bill is engaged in probing the curved petioles in search of the larvæ of certain insects which burrow in them. The particular palm-trees in which these larvæ reside only grow upon certain mountains, and it is only there that the Sabre-bills are to be met with.

THE SPINE-TAILED SYNALLAXIS (*Synallaxis spinicauda*) is an example of another South American group of this family. This bird measures about six inches in length, and is of a chestnut-brown colour above, white beneath; some spots on the crown of the head, the face, and a streak over each eye, are yellow. The tail is rather long, and its feathers are acutely pointed and terminated by spines; the four middle ones are rusty-red, and the remainder chestnut tipped with white. The species is an inhabitant of the southern extremity of the American continent. It resides amongst bushes, and feeds upon insects.

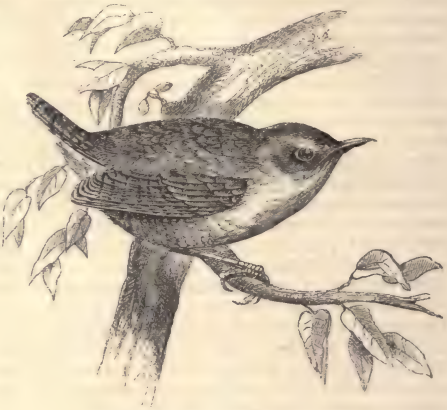
THE SHARP-TAILED ANUMBI (*Anumbius acuticaudatus*), which is nearly allied to the preceding species, is an inhabitant of tropical America. It is remarkable for the large size and curious construction of its nest. This is placed upon slender branches, and the mass of small spiny twigs heaped upon these is so great that they are bent down, and it becomes a wonder how such a quantity of materials can be collected and interlaced by such small architects. The edifice exhibits several external apertures, and contains many separate chambers, in each of which a small quantity of soft vegetable matter is deposited; thus it requires no small amount of trouble to detect the actual nest containing the eggs or young. The object of this voluminous habitation is said to be to give room for the young birds to move about when their strength permits them to take exercise; the different chambers and passages in the interior of the nest may also be of service in enabling them to escape and conceal themselves from any threatened danger. There are several nearly allied species which appear to have the same habits. Their food consists of insects, worms, and small mollusca, which they often seek upon the ground.

THE RED OVEN-BIRD (*Furnarius rufus*). Amongst the species of this family found in the warmer parts of South America, there are some to which the name of Oven-birds has been given, from the nature of the nest which they construct. The Red Oven-bird, which is one of the best known species, is about eight inches in length, and has the whole upper part of the body of a reddish-brown colour, and the lower surface white, with the flanks reddish-brown. It builds its nest always in an exposed situation, such as a naked branch, the palisades of a garden, or the windows of a house; forming it of earth, in the shape of a small oven. The nest is hemispherical in its form, and about six inches and a half in diameter; both sexes engage in its construction by bringing small pellets of clay, and working them into the edifice, and they carry on their operations so energetically, that they often complete the nest in two days. The opening is on one side, and the interior is divided by a partition into two chambers, in the inner of which the eggs are deposited. These nests are made use of for several successive years. This species, which occurs in the countries of La Plata, feeds like its allies upon insects, which it captures both on trees and on the ground. It is a gay and sprightly bird, perching and running with great agility.

THE SOUTHERN CINCLODES (*Cinclodes antarctica*). Some species of this family nearly allied to the Oven-birds, and forming the genus *Cinclodes*, are found principally upon the western coast of South America, especially towards the southern extremity of that continent, where they examine the sea-weeds thrown upon the shore, picking up the worms and small crustacea which adhere to them. According to Mr. Darwin, they may also be seen upon the floating fronds of the ***Fucus giganteus*** at some distance from land. The present species measures about five inches and a half in length, and is of a light sooty-brown colour, with a tawny band across the wings. It is found especially at the Falkland islands, where Pernetty states that it is so familiar that it will almost fly upon the finger, and that he killed ten in less than half an hour with a small stick almost without changing his position.

THE COMMON WREN (*Troglodytes vulgaris*). Besides the preceding forms, the family Certhiadæ includes our common British Wren, together with a considerable number of allied birds, distributed in all parts of the world. We can only refer to a few of the most remarkable of these. The common European Wren—fig. 108—is one of the smallest of our British birds, measuring only about four inches in length; its general colour is brown, streaked in parts with alternate lighter and darker shades; the quill-feathers of the wings and short tail are reddish-brown, with transverse black bars, and the throat and breast are whitish; the latter speckled with brown. The Wren is generally dispersed over the British islands, and, indeed, in all parts of Europe; and although strictly an insectivorous bird, it is a permanent inhabitant of these climates, and is even said to become more abundant towards the north. It is also found in Iceland, the Faroe Islands, and Greenland. During the severe weather of winter the Wrens usually approach the habitations of man, not unfrequently roosting in cow-houses, where the air is warmed by the presence of the cattle, or squeezing themselves in small parties into holes in thatch or walls, where their close approximation enables them to keep each other warm. In the spring, the wren resorts to the hedgerows, but even then continues to frequent the neighbourhood of gardens and farms, and this apparent familiarity and confidence in man, coupled no doubt with the diminutive size of the creature, renders this bird everywhere almost as great a favourite as the Robin. Nevertheless, a curious practice has prevailed from time immemorial in the south of Ireland, of hunting this harmless little bird on Christmas-day; the hedges are beaten with sticks, and when the unfortunate little creature is driven from its concealment, it is struck down with a second stick carried by each hunter. On St. Stephen's day the dead birds are hung by the children on an ivy bush decorated with bright ribbons, which they carry about with songs, and collect money "to bury the wren." This piece of cruel folly is now falling into disuse.

Fig. 108



The Common Wren (Troglodytes vulgaris).

The Wren flies but little, and only for short distances. When disturbed and driven out of one part of the hedge, he takes a little flight to another place, and then plunges into the bushes, and creeps through them often close to the ground, like a mouse. The male sings throughout the greater part of the year; his notes are shrill and lively. The nest of the Wren is large in comparison to the size of the architect; it is usually oval in its form, with a dome-like roof, and with a small hole for entrance either at the end or at the side. The materials of which it is composed vary according to the situation chosen for the structure. "If built against the side of a hayrick," says Montagu, "it is composed of hay; if against the side of a tree covered with white moss, it is made of that material; and with green moss if against a tree covered with the same, or in a bank. Thus instinct directs it for security." The female usually lays from seven to ten eggs, but this number is sometimes greatly exceeded, and as many as sixteen or seventeen eggs have been found in a wren's nest. When we consider that the Wren produces two of these enormous broods in a season, we may have some idea of the great amount of exertion that must be necessary on the part of the parents to supply so many mouths with the requisite quantity of insects and worms.

THE HOUSE WREN (*Troglodytes domesticus*), an inhabitant of the United States of America, where it is a bird of passage, is a more familiar bird, and also a far better songster than our common species. It is about four inches and a half in length, but has a longer tail and a longer and more curved bill than the European wren; its colour is deep brown above with transverse black bars on the back; the throat and breast are light brown, and the belly is mottled with black, brown, and white. In many respects, the habits of this species resemble those of our robin, especially its familiarity, boldness, and pugnacity. It haunts the gardens, and commonly builds about houses; where, as it is a great favourite, boxes are not unfrequently placed for the reception of its nest. The materials of the nest consist of small twigs, straws, and similar articles, and the interior is furnished with a warm lining of feathers. In this snug cradle the female lays from six to nine eggs, and the birds generally rear two broods in a season, the first in June, the second in July. As the food both of the parent birds and of the young consists of insects, especially caterpillars, the quantity of these noxious inmates of the garden destroyed by them must be very great, and their presence about the houses is highly beneficial. In defending their nests, the wrens exhibit great courage, often attacking birds twice as large as themselves, generally with success.

THE MARSH WREN (*Thryothorus palustris*), another North American species, is also a migratory bird, arriving in the latitude of Pennsylvania about the middle of May. It takes up its abode amongst the reeds and other plants bordering the rivers, and rarely moves to any distance from their banks. Its food consists of small flying insects, larvæ, and a species of green grasshopper which inhabits the reeds. Its note is described by Wilson as a low crackling sound, resembling that produced by air-bubbles forcing their way through mud in boggy ground when trod upon. As if in compensation for this want of musical talent, as Wilson remarks, the Marsh Wren exhibits architectural powers of the highest order. The nest is composed externally "of wet rushes mixed with mud, well intertwisted, and fashioned into the form of a cocoa-nut. A small hole is left two-thirds up for entrance, the upper edge of which projects like a pent-house over the lower, to prevent the admission of rain. The inside is lined with fine soft grass, and sometimes with feathers; and the outside, when hardened by the sun, resists every kind of weather. This nest is generally suspended among the reeds, above the reach of the highest tides, and is tied so fast in every part to the surrounding reeds as to bid defiance to the winds and the waves." The eggs laid in this comfortable little abode are usually six in number, and the birds commonly rear two broods in the season.

The Marsh Wren is five inches long. The upper parts are of a dark brown colour, except the top of the head, the back of the neck, and the middle of the back, which are black, streaked with white on the neck and back; the tail is short and barred with black; a white streak runs over each eye and down each side of the neck, and the lower parts are white.

THE LYRE-BIRD (*Menura superba*)—Plate 9, fig. 31. We conclude this family of diminutive birds, with a notice of an Australian species, which must rank as a giant among the members of a group so dwarfish. This bird is further remarkable from the puzzling nature of its characters, which long rendered its true place in the system very doubtful, the species having been placed originally with the gallinaceous birds, and afterwards in various positions amongst the Passeres. Mr. G. R. Gray considers the nearest affinities of the Lyre-bird to be with the Wrens, where we place it; some other recent writers consider it to be more nearly allied to the Ant-thrushes (*Formicariæ*), belonging to the succeeding section of the Passeres.

The Lyre-bird (*Menura superba*), which was described just sixty years ago, has a rather long and robust bill, a crested head, and a tail composed of very long and broad feathers, of which the two external ones are of the ordinary structure, but beautifully curved so as to represent the two sides of a lyre, whilst the rest are furnished only with long, slender, and distant barbs, so that the whole, when carried in the habitual erect position, form a most elegant tail. The legs and feet are long and strong, greatly resembling those of a gallinaceous bird at first sight, although the great development of the hinder toe and its claw is not common in that order. The toes also have no membrane to unite them at the base. The tarsus and toes are covered with shield-like plates. The general colour of the plumage is brown, with red tints upon the secondary quills, the upper tail-coverts, and the chin and throat; the lower surface is brownish-ash colour; the two outer feathers of the tail have the barbs long on the inside, and short on the outside, the inner barbs becoming less close towards the apex; these feathers are greyish-brown on the upper surface, and white beneath near the base; beyond this they are marked with bands of greyish and reddish-brown, and terminated by a black patch. The total length of the bird is about three feet and a half. In size and general aspect it presents no small resemblance to a pheasant, and it is known to the colonists of New South Wales under the name of the Wood Pheasant. Its habits also, in some respects, are very similar to those of a gallinaceous bird; it dwells principally on the ground, where it runs with great facility and scratches after the fashion of the true Gallinæ. So swift is it in its movements among the brushes of New South Wales, to which colony it is peculiar, that Mr. Gould declares it to be the most difficult to procure of all the birds he ever met with. "While among the brushes," says that distinguished ornithologist, "I have been surrounded by these birds, pouring forth their loud and liquid calls, for days together; and it was only by the most determined perseverance and extreme caution, that I was enabled to effect this desirable object."

Besides the loud call alluded to by Mr. Gould in the above extract, the Lyre-bird is found to possess a sweet and varied song, which is incompatible with gallinaceous nature. Its nest also is a neat structure, composed of sticks, roots, and moss, and covered with a dome-like roof; in this it lays usually two eggs, of a whitish colour, speckled with red. The food of the bird consists of insects, especially in the larval state, and, according to M. Verreaux, the larvæ of a species of cockchafer constitute its favourite food. The same ornithologist tells us, that when they quit their resting places in search of food, the males are usually followed by several females, although during the breeding season they live in pairs, and he adds, that besides their natural song, they imitate the notes of all other birds so accurately, as to deceive not only the ornithologist, but even the birds themselves.

A second species of the genus *Menura* was described about ten years since by Mr. Gould, under the name of *Menura Alberti*, PRINCE ALBERT'S LYRE-BIRD. It has a less developed tail than the *M. superba*, and is rather smaller in size, but agrees with it in its general appearance and habits.

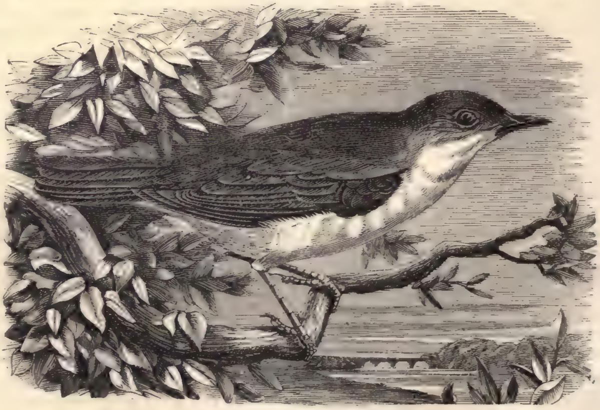
TRIBE III.—DENTIROSTRES.

THE birds forming this group of the passerine order are distinguished from those of both the preceding and following tribes, by having a more or less distinct tooth on each side of the upper mandible near the tip, which is also usually more or less hooked. The bill itself is sometimes slender and weak, sometimes stout and powerful; the teeth are generally strongest in the latter case, and some of these birds are as predaceous in their habits as the smaller hawks. The feet are slender, but generally armed with curved and acute claws. The number of species belonging to this group is very great, and they are divided into five families.

FAMILY I.—SYLVIIDÆ.

We commence with this family as making the nearest approach in its short slender bill to the Wrens with which the last tribe was concluded. The sides of the upper mandible are but slightly notched. The nostrils are placed at the base of the bill in a groove, and are uncovered. The birds have long wings and slender tarsi and toes, terminated by claws of moderate length. They are for the most part distinguished by a great power of song, and the term *Warblers* has been applied to the family. Their food consists almost entirely of insects and worms; and hence those species which inhabit cold and temperate climates are generally migratory.

Fig. 109.



The Nightingale (Philomela luscinia).

THE NIGHTINGALE (*Philomela luscinia*)—Fig. 109.—We cannot better commence our illustrations of this family of vocalists than with the description of this bird, which is universally, and perhaps with justice, regarded as the most charming songster of our woods and groves.

From the moment of his arrival in this country the male Nightingale pours forth his melody, not only during the day, but even in the silence and darkness of the night, at which period his notes strike the ear with more striking effect than when mixed up with the voices of other feathered choristers. The beauty of this nocturnal music has furnished a theme of admiration for poets and writers in all ages, whose descriptions of evening would almost seem incomplete if the Nightingale did not warble from the grove; but none of them, perhaps, have done more justice to his vocal powers than old Izaak Walton, in the following speech which he puts into the mouth of one of the persons in his dialogue:—"The Nightingale," says Auceps, "another of my airy creatures, breathes such sweet loud music out of her little instrumental throat, that it might make mankind to think that miracles are not ceased. He that at midnight, when the very labourer sleeps securely, should hear, as I have very often, the clear airs, the sweet descants, the natural rising and falling, the doubling and redoubling of her voice, might well be lifted above earth, and say—Lord, what music hast thou provided for the saints in heaven, when thou affordest bad men such music on earth!"

Like many other charming singers, the Nightingale is by no means remarkable for the beauty of its personal appearance. Its general colour is brown, with a reddish tinge above, dull greyish-white beneath; the beak and legs are brown, and the eyes, which are rather large and very bright, have the irides hazel. The whole length of the bird is about six inches and a half. The Nightingales arrive in this country about the middle of April, the males preceding their partners by a few days. They do not occur in the extreme western parts of England, nor in Ireland; and their range to the northward extends in this country only into Yorkshire, although on the continent they reach as far as Sweden. They frequent woods, plantations, and orchards, and feed on insects and spiders. The nest, which is composed of leaves, grass, and rushes, lined with a few fibrous roots, is usually placed in a hollow in the ground, and very loosely put together. The eggs are four or five in number, and of an olive-brown colour; they are deposited early in May, and the young are hatched in June.

THE BLACKCAP (*Curruca atricapilla*), another British species, nearly allied to the Nightingale, is also a beautiful songster, scarcely, if at all inferior to his more celebrated relative. This bird measures about six inches in length, the female being rather larger than the male; the plumage of both is of an ash colour more or less tinged with brown, and the crown of the head is black in the male, and chestnut brown in the female. The Blackcap is an inhabitant of Europe, Asia, and Africa; it migrates into temperate climates in the spring, reaching this country about the middle of April, and departs southward again in September. During the summer it occurs in most parts of England and in some localities in Scotland, but is almost unknown in Ireland. Its habits are similar to those of the Nightingale, but it feeds partly upon fruits.

THE GARDEN WARBLER or GREATER PETTYCHAPS (*Curruca hortensis*) is very nearly allied to the preceding, and like it is a summer visitor to Britain. It is a good songster, emitting a wild and rapid strain, which is often continued for half an hour without a pause. Two other nearly allied species, the WHITETHROAT (*C. cinerea*), and the LESSER WHITETHROAT (*C. sylviella*) are also common in this country.

THE WOOD WARBLER (*Sylvia sylvicola*), which is generally distributed in England, usually makes its appearance in this country about the end of April, and takes up its abode in woods and plantations. Its food consists of insects and their larvæ. This bird builds a domed nest upon the ground amongst the herbage, forming it of dry grass, leaves, and moss, and lining it with fine grass and hair, but with no feathers. The eggs are six in number, white, spotted all over with deep red and ash colour.

THE WILLOW WARBLER (*Sylvia Trochilus*), another British species, arrives in this country about the middle of April, and extends its range into Scotland. It is common about woods, plantations, and hedges, and makes its nest upon the ground much in the same way as the preceding species, but lines it with feathers.

THE CHIFF CHAFF (*Sylvia Hippolaïs*) is a very early visitor to Britain, arriving here before any of the other members of this family, with the exception of the Wheatear. It is a very small species, and its name is derived from its note, which resembles the syllables *chiff chaff*, frequently repeated. In its general habits it resembles the preceding species.

THE DARTFORD WARBLER (*Melizophilus Dartfordiensis*) has received its name from having been first discovered in the neighbourhood of Dartford in Kent. It appears to remain in Britain throughout the year, or at least many specimens have been observed here during the winter. Furze-covered commons are its favourite haunts; it dwells and builds its nest amongst the furze-bushes, the strong prickles of which make a formidable fence around the little dwelling. Hence it is called in some places the *Furzeling* or *Furze Wren.* Its food consists principally of small insects, which are generally caught in the air.

THE GOLD CREST (*Regulus cristatus*), which is also called the KINGLET, is the most diminutive of British birds. It is a permanent resident in this country, and indeed receives a considerable accession to its numbers during the winter by a migration from the more northern parts of Europe. It usually inhabits fir woods, where it may be seen exploring the twigs and branches in search of insects, hopping and creeping about with great vivacity, and associating freely, not only with its own species, but also with the Titmice and Creepers, which resemble it somewhat in mode of life. Its nest is cupshaped, composed of moss and lined with feathers; it is suspended from three or four twigs beneath the branch of a fir-tree so as to be sheltered from above. The eggs vary in number from six to ten; and the female, while engaged in hatching and bringing up her young, is very bold, allowing the nest to be looked into, and even submitting to be handled without shrinking from her duties. The male has a soft and agreeable song. The length of this pretty little bird is about three inches and a half; its plumage is yellowish-olive above and yellowish-grey beneath; on the crown of the head it bears a bright orange crest, bordered on each side with black. Several other species of *Regulus* are known, and two of these have been seen in this country.

THE REED WARBLER (*Calamodyta arundinacea*) visits this country in April, and departs again in September. During its stay here it takes up its abode amongst the reeds and osiers which fringe our rivers and lakes. The nest of this species is built amongst the reeds. It is composed of long grass, and of the seed branches of the reeds, and is attached by its sides to three or four reeds; it is of an elongated conical form externally, and its cavity is also very deep, in order to prevent the eggs from rolling out when the reeds are swayed by the wind. The food of this and of several other species, which like it haunt the reeds and sedges about our fresh waters, consists of worms, slugs, and insects.

THE SEDGE WARBLER (*Calamodyta phragmitis*), one of these species, is far more common than the Reed Warbler, in company with which it is usually found. Another species has been called the GRASSHOPPER WARBLER (*C. locustella*), from its almost constantly emitting a shrill cricket-like note.

THE INDIAN TAILOR BIRD (*Orthotomus longicauda*). Several species of this family, generally inhabitants of the East Indies, are remarkable for the extraordinary mode in which their nests are made, which has procured for them the name of Tailor Birds. The present species, to which the name was applied by the older naturalists, is common in most wooded districts of India, and also frequents the gardens, where its singular mode of nidification may often be observed. Selecting a suitable leaf, the ingenious little architect proceeds to draw the edges together by means of its bill and feet; then piercing holes through the approximated edges, it secures them in their place by means of threads of cotton, at the ends of which it leaves small bunches to prevent their drawing through. Sometimes the bird picks up a fallen leaf, and applying it to one still growing on the tree, sews the edges together in the same way, and thus prepares a hanging cradle for its nest. The cavity is filled up with a mass of cotton, flax, and other vegetable fibres, mixed with a little hair, and in this comfortable bed the eggs are deposited, and the young brought up secure from the attacks of snakes and monkeys.

THE BLUE WREN (*Malurus cyaneus*) of the Australian colonists, is an abundant species in the brushes of New South Wales, and during the winter becomes very tame, haunting the gardens and houses of the settlers. The male is a beautiful bird, having the upper parts and the chest black, with the crown of the head, the ear coverts and a crescent-shaped mark on the back light blue, the wings brown, and the belly white. The female is of a brownish tint, paler, or whitish beneath. The habits of this bird are somewhat similar to those of the European Wren, which it also resembles in its song. The nest is built in a bush or tuft of grass; it is domed, with a hole at one side near the top. The eggs are white, spotted with reddish-brown. Several nearly allied species are found in different parts of Australia.

THE EMU WREN (*Stipiturus malacurus*), which resembles the preceding in its general structure and habits, and is an inhabitant of the whole southern part of Australia and Van Diemen's Land, is remarkable for having the tail composed of long feathers, with the barbs widely separated, or decomposed, giving the bird a singular appearance. Both the male and female are reddish-brown, with the feathers of the upper surface streaked and spotted with dark brown; the male has the throat blue. It is a rather shy bird, residing in marshy districts amongst long grass and rushes; its wings are very short, and it flies but little, but runs upon the ground with great ease and rapidity, carrying its tail elevated over the back.

THE AUSTRALIAN SINGING LARK (*Cincloramphus rufescens*) is one of the few Australian birds which deserve notice on account of the sweetness of their song. It is found in all parts of Australia, and dwells principally on the ground, from which it ascends perpendicularly to a great height in the air, singing both in its ascent and descent in the manner of our skylark. Two other nearly allied species are met with in Australia, one of which is called the Skylark by the colonists of Port-Phillip.

THE REDBREAST (*Erythacus rubecula*), Plate 10, fig. 33.—This favourite little native of our islands is too well-known to need any description. He is a permanent resident with us, and also in all the temperate parts of Europe, but in the colder northern regions he is a summer bird of passage. In every place where he occurs, he is regarded with a greater degree of favour than is shown to any other wild bird; his red vest and bright eye seem to make him friends wherever he goes, and the affection with which he is welcomed at the cottage door is heightened by the boldness and sprightliness of his habits. In the winter, especially, when his favourite food is scarce, and the places where he might seek it covered up with snow, the Robin seems as it were to cast himself upon the charity of man, not only coming about human habitations to pick up what he can, which is done by many other birds, but actually coming to show himself on the window sill or threshold, as if asking to have his wants supplied. Even in the breeding season, when most birds become very shy, the Robin does not lose his confidence in man, but builds his nest either in the hedgerow or about the sheds and outbuildings, sometimes in places where a considerable amount of bustle is going on. The nest is cupshaped, and composed of moss, leaves, and grass, lined with hair and feathers; it usually contains five or six eggs, which are white, with pale reddish-brown spots. The song of the Robin is very sweet and powerful, and is continued throughout the whole warm season from spring to late in autumn.

THE INDIAN ROBIN (*Thamnobia fulicata*). This bird, like its English namesake, is a great favourite in its native countries, where it frequents the abodes of man as boldly and familiarly as our Robin. It sits upon the housetops and fences, descends into the verandahs to feed, and sometimes even enters the houses. The male has a sweet and pleasing song. The food of this species consists principally of insects, which it pursues upon the ground with great assiduity.

THE MAGPIE ROBIN (*Copsychus saularis*), which, like the preceding, is a native of India and Ceylon, is also a great favourite, both on account of its familiarity, and for the beauty of its song. As a song-bird it is often kept in a cage, and the Hindoos, according to Mr. Hodgson, are very fond of setting these tame birds to fight, which they do with remarkable courage and pertinacity. The pugnacity of the birds is so great, that the birdcatchers take advantage of it in order to capture the wild males. They take a tame male perched on the finger, to the nearest garden or grove; the bird utters his call at his master's bidding, when any wild male within hearing answers the challenge, and the tame bird being slipped, a desperate combat ensues, in the course of which the birdcatcher is able to secure his prize; the tame bird being even said to assist in the capture of his adversary, by holding him in his bill and claws.

THE BLUEBIRD (*Sialia sialis*), partly takes the place of the Robin in the United States of America, to which he is a summer visitor, passing the winter in the West Indies and the tropical parts of the American continent. In his form and habits the Bluebird exhibits a great resemblance to the Robin, and like him has a bright red breast, but the colour of the upper surface is light blue. He is a bold, familiar, and pugnacious bird, and during the summer pours forth a song which is described by American naturalists as exceedingly sweet. The nest of this species is built in the hole of a tree or some similar situation, and the eggs are five or six in number, and of a pale blue colour. The food of the Bluebird consists principally of insects and spiders; but in the autumn it also eats fruits.

THE REDSTART (*Ruticilla phœnicura*), which is nearly allied to the Robin, is a summer visitor to this country, where it is generally distributed, but by no means abundant. In its general habits it resembles the Robin, and like it jerks its rather long tail up and down at every movement; it is from this habit and the red colour of the tail that it has received the name of Redstart. The male Redstart is lead-grey above, and pale chestnut beneath, with the throat and face black, the forehead white, and the tail reddish chestnut; the female has neither black nor white on the head, and her colours are paler than those of the male. The whole length of the bird is rather more than five inches.

The Redstart is an active and lively bird; it haunts woods, hedge-rows, and orchards, and is said to be very partial to old walls covered with ivy. Its food consists, like that of the Robin, of worms, insects, spiders, and fruits. Its song is soft and sweet. The nest is composed of moss and lined with hair and feathers, and placed sometimes in a hollow tree or a hole in a wall, sometimes behind the trained branch of a fruit-tree, and sometimes on the ground. The females usually lay from four to six eggs, which are of a uniform greenish-blue colour; and the birds sometimes produce two broods in a season. Two other species, the BLUE-THROATED (*R. suecica*), and the BLACK REDSTART (*R. Tithys*), have been taken in this country.

THE SCARLET-BREASTED ROBIN (*Petroïca multicolor*) is an inhabitant of the whole southern part of Australia, where it is known to the colonists generally under the familiar English name of the Robin. The male is black, with the forehead, some bands on the wings, and the belly white, and with the breast scarlet; the female is pale brown, with the breast red. The whole length of the bird is about five inches. The song of the male somewhat resembles that of the English Robin, but is weaker. The Scarlet-Breasted Robin dwells amongst the woods and brushes skirting the plains, and builds its nest usually in the hollow of a tree; the eggs are three or four in number, and it breeds two or three times in the season.

THE FLAME-BREASTED ROBIN (*Petroïca phœnicea*) closely resembles the preceding species, whose place it takes in Van Diemen's Land. This bird is, however, more terrestrial in its habits than the Scarlet-breasted Robin, but builds its nest in the same way in the hollow of a tree.

THE PIED ROBIN (*Petroïca bicolor*).—Besides the preceding and several other red-breasted species, the genus *Petroïca* includes some birds in which black and white, or brown, are the prevailing colours. The Pied Robin, which is one of these, exhibits an elegant contrast in the deep black and pure white of its plumage; it is distributed in most parts of the Australian continent, living principally in the open country, but selecting those plains which are studded over with large trees. It passes much of its time on the ground in pursuit of the insects on which it feeds.

THE ROCK WARBLER (*Origma rubricata*).—Of this singular little bird, which is an inhabitant of New South Wales, Mr. Gould gives the following account:—"Its usual places of resort are the neighbourhood of water-courses and stony, rocky gullies. So exclusively, in fact, is it confined to such situations, that it never visits the forests, nor have I ever seen it perching on the branches of trees; indeed, it would seem to have an aversion to so doing, as it does not even resort to them as a resting-place for its nest, but suspends it to the ceilings of caverns and the under-surface of over-hanging rocks in a manner that is most surprising. The nest, which is of an oblong, globular form, and composed of moss and other similar substances, is suspended by a narrow neck, and presents one of the most singular instances of bird architecture that has yet come under my notice." This ingenious little architect is of a dull brown colour, reddish beneath, with the throat grey; its total length is about five inches.

THE STONECHAT (*Saxicola rubicola*) is a permanent resident in Britain, where it resides upon furzy commons and heaths. It is rather smaller than the Redbreast, and has the head, throat, and back black, the breast chestnut, and the belly yellowish-white. The sides of the neck are white. The female is lighter in colour than the male. The Stonechat is an active and lively bird, constantly flitting from one bush or stone to another, and dashing off in pursuit of passing insects which it captures in the air, all the time keeping up a continual twittering from which its name of Stonechat or Stonechatter is derived. Its song is agreeable, though short. The nest is built on or close to the ground under the shelter of a bush; it is composed of moss and grass. The eggs are five or six in number, greyish-blue, speckled with reddish-brown at the larger end.

THE WHINCHAT (*Saxicola rubetra*) resembles the preceding species in its general habits, and in its partiality for furze-covered commons even exceeds it; but it is a bird of passage in this country, only dwelling with us through the summer. The nest resembles that of the Stonechat, but the eggs are bluish-green, with a few very small specks of reddish-brown.

THE WHEATEAR (*Saxicola Œnanthe*), which is nearly allied to the preceding species, is a migratory bird, reaching us in March, and taking its departure for the south in September. It is much prized for the table; and in the autumn great quantities of Wheatears are captured upon our south downs by the shepherds, by a simple trap consisting of a covered passage cut in the turf, within which is a small stick supporting two horse-hair nooses. The birds run into the passage at the least alarm, when they can hardly avoid catching their necks in one of the treacherous loops of horsehair.

THE INDIAN NIGHTINGALE (*Kittacincla macroura*), a species nearly allied to the Stonechats and Redstarts, is a splendid songster, which, like the European nightingale, sings beautifully at night. Mr. Tickell, describing the melody of this bird, says—"The strains sweep with a gush of sweetness through the enchanting solitudes which this bird makes its favourite resort, at times when other birds are silent in rest; and in unison with the surrounding scenery, in which Nature seems to have lavished every fantastic invention of beauty, the effect produced upon the mind and ear can alone be appreciated by those who have witnessed the magnificence of a tropical forest." In Calcutta many thousands of these birds are kept in confinement, with their cages darkened by several folds of cloth wrapped round them, and the richer natives employ servants to carry their birds about in the streets. Mr. Blyth informs us that the birds, although shut out from all light and air, "like Mahometan ladies enjoying their evening drive," nevertheless sing forth most lustily and melodiously.

THE HEDGESPARROW (*Accentor modularis*).—Of the genus *Accentor*, which includes a considerable number of species, found in various parts of the world, we have one species which is an abundant and permanent resident in Britain. This bird, the Hedge-warbler or Hedge-sparrow, is very generally distributed about hedges and gardens, where it builds its nest of moss and roots, lined with wool and hair, completing it so early in the season that, from the hedges being bare of leaves, it is very easily discovered, and is consequently exposed to be plundered by every mischievous urchin that passes by. The delicate greenish-blue eggs of the Hedge-sparrow, indeed, generally constitute the greater proportion of those which are to be found on the strings of country-boys, so that, as Mr. Knapp observes, it is almost a wonder that the species is not extirpated. The birds, however, rear two broods in a season, which may to some extent compensate for the wholesale destruction of their eggs that takes place in the spring. The male Hedge-sparrow has a short but sweet song, which it continues to utter nearly all the year round. In the winter it frequently approaches houses like the Robin in search of food.

THE YELLOW-THROATED WARBLER (*Sericornis citreogularis*), a native of the brushes of New South Wales, measures about six inches in length, and is of a brown colour, with the belly white, the throat yellow, and the sides of the face black; above each eye is a long yellow streak. This bird constructs its nest in the bunches of moss which are often suspended from the extremities of the branches of trees in the Australian forests, and which consequently swing about violently when agitated by the wind. This, however, does not appear to disturb the bird, who probably considers that such an inconvenience is amply compensated by security from other dangers.

THE YELLOW-TAILED ACANTHIZA (*Acanthiza chrysorrhœa*).—Of several species of the genus *Acanthiza* found in various parts of Australia, this is the most abundant and generally distributed, being found in all the southern parts of that continent, and also in Van Diemen's Land. It is a small bird, of an olive-brown colour above, whitish beneath, with the rump and upper tail-coverts bright yellow. It builds a domed nest of grasses and leaves, and rears three broods in the season. This is one of the birds in whose nest the Bronze Cuckoo of Australia deposits its egg.

THE BLUE TIT (*Parus cæruleus*), a well-known British bird, frequently called the TOMTIT and the TITMOUSE, is a diminutive, but handsome, active, and lively creature. It is seen commonly in woods and plantations during the summer, but in the winter frequently resorts to gardens and orchards, where it may be observed clinging to the branches in every possible position, engaged in a minute search for the insects which shelter themselves from the inclemency of the weather in the crevices of the bark and within the buds. The Blue Tit will also peck at meat, and has been known to visit the butchers' shops for this purpose. The nest of this bird is made with a large quantity of moss, hair, and feathers in a hole in a wall or tree, and here the female lays usually from eight to ten eggs, although twelve, fourteen, and even eighteen have been found in a nest. The eggs are white, spotted with pale red. When sitting, the female exhibits great courage in the defence of her eggs; she does not quit her nest when threatened with danger, but puffs out her feathers, hisses at the intruder, and pecks at his fingers, a habit from which the boys in some parts of England have bestowed the expressive name of "Billy Biter" upon the Blue Tit. This bird is abundant in all the temperate parts of the European continent, and is also recorded as a native of Japan and Formosa.

THE GREAT TIT (*Parus major*), which is the largest species of its genus, measures nearly six inches in length, and like the preceding species, which it resembles in habits, is a common bird in this country. This bird is said occasionally to kill small birds by repeated blows on the head with his hard and sharp bill, after which he breaks open the skull, and picks out and eats the brains of his victim.

THE COLE TIT (*Parus ater*) and the MARSH TIT (*P. palustris*), are common British species, especially in the southern parts of the island; the latter is distinguished by its preference for marshy districts, where it dwells amongst the willows and alders.

THE CRESTED TIT (*Paruscristatus*), a less abundant species, distinguished by the possession of an elegant crest of black and white feathers, is found principally in fir woods, both in this country and on the continent. The exotic species of the genus resemble the preceding in their habits, and need not be specially alluded to.

THE LONG-TAILED TIT (*Mecistura caudata*)—Plate 10, fig. 32—is an abundant and generally distributed bird in Britain, where, like its allies, it haunts the woods, hedges, and gardens in search of insect food, to which it appears to restrict itself more decidedly than some of the preceding species. It is readily distinguished from them by its long and graduated tail. This bird also differs from the other Tits in its mode of nidification; its nest being a neat and comfortable structure, firmly placed amongst the branches of a thick bush, composed of moss and wool, thickly lined with soft feathers, and adorned externally with fragments of white lichens, which give it an elegant appearance. It is of an oval form, snugly domed over at the top, and with a single opening rather high up on one side for the entrance of the bird.

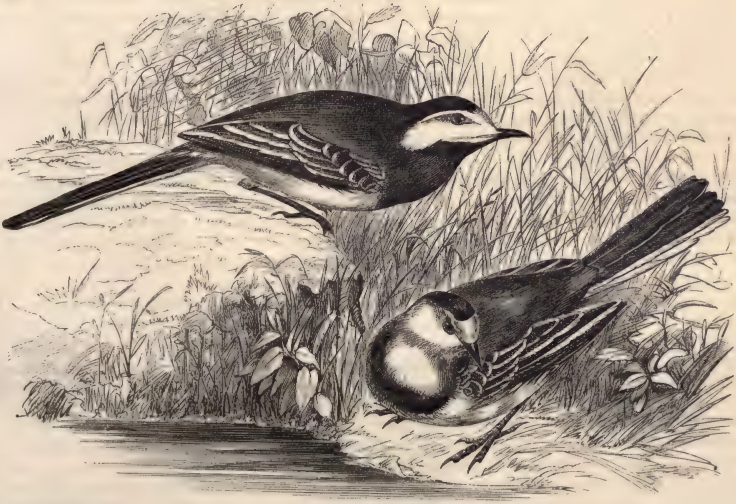
THE BEARDED TIT (*Calamophilus biarmicus*), unlike the other Tits, resides amongst the reeds and sedges which fringe our rivers, lakes, and ponds. Its food consists partly of insects and seeds, and partly of the small shelled mollusca which abound in the vicinity of water; it is provided with a muscular gizzard by which the shells of these animals are speedily broken up. Its nest is built amongst the sedges near the ground.

THE BLUE-EYED YELLOW WARBLER (*Mniotilta æstiva*) is an example of a considerable group of the family of Warblers, which possesses a certain resemblance in habits to the creepers. This bird is a common species in the United States of America, where it is a summer visitor, arriving in the middle states early in May, and departing in September. It retires for the winter to the West Indies, and the tropical parts of South America. The plumage is greenish-yellow above, golden-yellow beneath, with the breast streaked with dark red; the bill and eyelids are blue. It is an active and familiar bird, which is seen in the gardens and shrubberies creeping about with sprightly movements upon the fruit-trees and bushes in search of its food, which consists principally of small green caterpillars. Its nest is neatly made of flax or tow, on a forked branch, and lined with hair and vegetable down.

THE WORM-EATING WARBLER (*Mniotilta vermivora*).—Besides the preceding, numerous species of the group to which it belongs are found in America, and of these the Worm-eating Warbler is, like it, a summer visitor to the United States. It is an exceedingly active and sprightly bird, and feeds upon small caterpillars and spiders.

THE WHITE-EYED WARBLER (*Zosterops palpebrosus*), is a common East Indian species, nearly allied to the two preceding. It migrates from the plains to the mountains at the approach of the hot season, ascending to a considerable elevation, and feeding partly upon insects which it captures in the flowers, and partly on the small black berries of a species of *Rhamnus*. The nest of this bird is described by Captain Hutton as being suspended by means of silk from two thin twigs of a tree, composed of the same materia. with moss, cotton, and other vegetable matters, and lined with hair, the silk being used to bind the other materials together; the whole forming a little oval cup,

Fig. 110.



The Pied Wagtail (Motacilla Yarrellii).

which is so well put together that, although it looks so slight and fragile that the weight of the parent bird would be thought capable of bringing it down, it will, with its contents, outride a gale that will bring the weightier nests of jays and thrushes to the ground.

THE PIED WAGTAIL (*Motacilla Yarrellii*).—Fig. 109, preceding page.—The Wagtails and Pipits with which we close the present family, form together a peculiar group which evidently approaches the Larks, in the conirostral family of the Finches. The characters which chiefly indicate this analogy, consist in the great development of the hinder claw, and in the structure of the wings, which have the tertiary quills much elongated and pointed. Both the Wagtails and the Pipits are for the most part terrestrial in their habits, and run upon the ground by the alternate motion of their feet.

The Pied Wagtail is a well-known British bird, usually found in the immediate vicinity of water, where its elegantly pied plumage and graceful movements render it a conspicuous object. On the margins of rivers and ponds, and in damp meadows, this beautiful little bird may constantly be seen running about, or flying from one spot to another with a graceful and buoyant flight, and accompanying every movement with a singular perpendicular wagging of the tail, a habit common to all the species and from which their popular name is derived. The food of this species, as of all the other Wagtails, consists principally of insects, which it finds in abundance in the damp places frequented by it, where also small mollusca and worms occur freely, and doubtless form a portion of its diet. Frequently also the Wagtail may be seen wading in the shallowest parts of the water, and from an observation made by Mr. Rayner of Uxbridge, it would appear that when thus engaged these birds are in pursuit not only of aquatic insects, but also of fish. They will also capture insects on the wing, in the manner of the flycatchers, by flying up from the ground in pursuit of them as they pass along.

In the southern counties of England this bird is a permanent resident. It is common in the summer in the north, and extends its range into Norway and Sweden, but does not occur in the more southern parts of the continent of Europe, where its place is taken by a nearly allied species. The nest is composed of moss, grass, and roots, and lined with hair and feathers. It is placed sometimes on the ground, sometimes in a hole in a wall, a thatched roof, a hay rick or wood stack, or in some similar position. The eggs are four or five in number, white, with ash-coloured spots, and the birds appear to rear two broods in the season.

THE WHITE WAGTAIL (*Motacilla alba*) with which the preceding species was formerly confounded, is an abundant bird all over the continent of Europe, but is only an occasional visitor to this country. The habits of the two birds seem to be very similar. The distinctions between the two species according to Mr. Yarrell, are "that the beak of our Pied Wagtail is broader than that of the White Wagtail throughout its whole length from the point to the more dilated base; and that while our pied bird changes on the back from ash-grey to black in the breeding season, the back of the white bird remains as light in colour as it is in winter."

THE GRAY WAGTAIL (*Motacilla boarula*) is another abundant British species; it performs a nearly total migration within the boundaries of our island, being a summer visitor to the northern counties, and a winter visitor to the southern ones. Its habits are similar to those of the Pied Wagtail, but it is even more aquatic, and feeds freely upon the common small fresh-water bivalves (*Cyclas cornea*), and probably upon other mollusca. It often runs upon the tops of weeds in ditches.

RAY'S WAGTAIL (*Budytes Rayi*), unlike the preceding species, is a summer visitor to this country, where it arrives about the end of March, taking its departure again in September. The plumage of its upper surface is pale olive, with the wings brown, and that of the lower surface bright yellow. In its habits it is less aquatic than any of the preceding Wagtails, but frequents pastures and cornfields in search of insects, not unfrequently attending sheep and cattle whilst grazing, and running about almost under their feet to pick up the insects and worms disturbed by their movements. The nest is placed on the ground.

THE MEADOW PIPIT (*Anthus pratensis*), also known as the TITLARK, is a permanent resident in Britain, and occurs all over the continent of Europe, in Northern Africa, and in Asia. It measures about six inches in length, is of a brown colour above, and whitish beneath, with the breast spotted with dark brown. Commons and waste lands are the favourite resort of this bird, where it seeks its food, consisting of insects, worms, and slugs, upon the ground, running along with great facility, and occasionally vibrating its tail in the manner of the Wagtails. The nest is built upon the ground amongst herbage, and usually contains from four to six eggs; it is one of the favourite nests with the cuckoo for receiving her eggs. The song of the male is soft and musical, but short; it is usually uttered whilst hovering over the nest.

THE TREE PIPIT (*Anthus arboreus*), a summer visitor to Britain, is found only in the wooded parts of the southern counties. Like the preceding species, the Tree Pipit runs freely upon the ground, where it seeks its insect food, and constructs its nest; but the male perches upon the branch of a tree or bush when engaged in singing.

THE ROCK PIPIT (*Anthus petrosus*), a third common British species, is a permanent resident in our island, where it haunts every part of the sea-coast. In its general habits it resembles the preceding species, seeking its food by running about upon the wet beach, and carefully examining the sea-weed left by the retiring tide, in search of small crustacea and other marine animals. Its nest is made upon the ground, or on the ledge of a rock, usually facing the sea. A fourth species, RICHARD'S PIPIT (*Anthus Richardi*), has occasionally been met with in this country; but it is very rare, not only here, but also on the continent.

THE COMMON INDIAN PIPIT (*Anthus rufulus*), and the **INDIAN TREE PIPIT** (*A. agilis*), are abundant birds in India during the cold season, probably migrating to the northward for the summer. The former resembles our Meadow Pipit in its habits; the latter is found in small flocks about trees, and in gardens, and wooded water-courses, and feeds both upon the ground and amongst the branches. According to Mr. Elliott, "its flesh is used by falconers as a restorative to the Bhyree (*Falco peregrinus*)," and is said to be very delicate.

THE BROWN LARK (*Anthus ludovicianus*) is an American species of Pipit which migrates southward into the United States in the autumn, returning again towards the north in April and May. It is six inches in length, brownish-olive above, brownish-yellow beneath, with black spots on the breast; the quill feathers of the wings are brown, the tertials black, and the tail black, with the outside of the external feathers white. It breeds in the Hudson's Bay Territory, and on the Labrador coast, and probably in all the northern parts of the American continent, making its nest on the ground at the foot of the rocks.

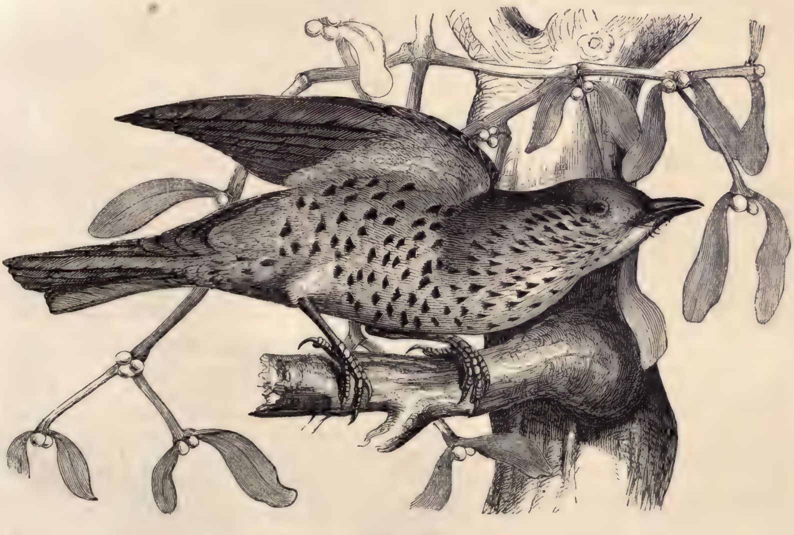
FAMILY II.—TURDIDÆ.

The birds of this family, which includes the well-known Thrushes, and a great number of allied species, have a bill of moderate length and thickness, with the upper mandible arched and keeled above, and finely notched or toothed near the tip on each side. The hinder part of the gape is bordered with a row of rather short bristles; and the nostrils, which are of considerable size and oblong in form, are placed on the sides of the base of the upper mandible, and partly covered by a membranous scale. The wings are generally well developed, as are also the legs, which have the tarsi compressed, and usually clothed in front with seven shields, of which, however, some are frequently united so as to form a single plate, covering nearly the whole front of the tarsus.

These birds are distributed in all parts of the world. Their food consists partly of insects, worms, and terrestrial mollusca, and partly of fruits. Many of them possess great powers of song.

THE MISSEL THRUSH (*Turdus viscivorus*)—fig. 110—which is also a permanent resident in this country, is a much larger bird than the preceding, measuring about eleven inches in length. The spots on the belly and breast of this bird are rounded in form. The Missel Thrush is generally met with in small woods, orchards, and hedgerows; its food consists of insects, worms, and slugs, and in autumn and winter of fruits and berries. Of the latter the berries of the misseltoe are said to constitute a favourite portion of its food; and by its devouring these berries, and afterwards passing the seeds uninjured from its body, it is supposed to contribute greatly to the diffusion of that singular plant. The song of this Thrush is far inferior to that of the Song Thrush, and somewhat resembles that of the Blackbird; it is often heard before storms of wind and rain, and hence the bird is sometimes called the Stormcock. The nest is built in the forked branch of a tree, and is composed externally of moss, grass, and lichens, and lined with a coating of mud, within which there is a layer of fine grass. The eggs are greenish-white, with reddish-brown spots; there are usually four or five of them in the nest.

Fig. 110.



The Missel Thrush (Turdus viscivorus).

THE SONG THRUSH (*Turdus musicus*).—This well-known British bird, whose spotted breast and sweet song must be familiar to every one, is found in all parts of Europe during the summer, but quits the extreme northern countries at the approach of winter, when even our island receives a considerable accession of numbers from Denmark and Sweden. It is found in the wooded districts, and commonly haunts orchards, and gardens containing trees, where it commits considerable depredations upon the fruit. On the continent the Thrush feasts in autumn upon the ripe grapes, and at this time its flesh is highly esteemed there as an article of food. Besides fruit, it devours caterpillars and other insects, and thus no doubt fully repays the gardener for any damage it may do to his fruit crops; and the equally destructive snails also constitute a favourite portion of its diet. In getting at the latter delicate morsels, the Thrush exhibits much ingenuity; it breaks their shells upon a stone, shakes off the fragments most dexterously, and then swallows the soft body. Of all the larger singing birds, the Thrush is probably the best, as its song is rich, powerful, and varied, and continued with but little intermission from early in the spring till autumn. Its nest, which is built early in the year, is usually placed in the centre of a thick bush; it is cup-shaped, composed externally of moss and fine roots, and neatly plastered inside with a mixture of cowdung and rotten wood. The nest generally contains four or five eggs, which are of a light blue colour, with a few black spots at the larger end.

THE REDWING (*Turdus iliacus*) is a winter visitor to this country and to all the southern parts of Europe, passing the summer and breeding in the north. It is rather smaller than the Song Thrush, and is of a rich clove brown colour above, and whitish beneath, having the breast and belly spotted with dark brown in the same way as the Song Thrush. It arrives in England about the middle of October, coming in flocks from the Scandinavian peninsula and Denmark, and taking up its abode amongst the trees in our parks and pleasure grounds. The food of this species consists of insects, worms, and slugs, but it scarcely seems to eat berries, and in severe weather the Redwings are observed to be the first birds that suffer. In the north of Scotland, and sometimes even in more southern localities, the Redwings have been known to stay through the summer; but most of them quit us in the spring, and take their way to the north, where they build their nests and bring up their young. The song of the male is so beautiful, that it is called the Nightingale of Norway.

THE FIELDFARE (*Turdus pilaris*). This bird, which is a winter visitor to Britain, is a permanent resident in Central Europe, and a summer visitor to Sweden, Russia, and Siberia. It is a hardy bird, and is the latest of our winter visitors in its arrival. In its general habits it resembles the preceding species, but, unlike the Redwing, feeds freely upon berries, as well as upon insects, slugs, and other small animals. Its song is described as soft and sweet.

THE BLACKBIRD (*Turdus merula*), with his deep-black plumage, and bright yellow bill, is too well known to need any description. This bird is a permanent resident in Britain, and in the southern parts of Europe, but migrates for the winter from the more northern regions. It haunts woods and plantations, and is a shy and vigilant bird, flying off when disturbed with a loud cry, sufficient to alarm all the other inhabitants of the grove. The food of the Blackbird consists of the same materials as that of the preceding species, although, perhaps, he exhibits a still greater partiality for fruit than even the Song Thrush, and his depredations in the garden are so extensive, that he is everywhere regarded as an enemy by gardeners. In this case, however, as in many others, it may fairly be questioned whether the bird does not amply pay for the fruit that he consumes by his services in ridding the garden of insects, slugs, and snails, of which he destroys great quantities in the spring and early summer.

The nest of the Blackbird is built early in the spring, usually in the midst of some thick bush. In its structure it resembles that of the Missel Thrush. The eggs, usually four or five in number, are of a pale blue colour, speckled with reddish-brown. During the breeding season the male has a loud and powerful song; which, however, is not very varied. In captivity he has been known to imitate various sounds, even clucking like a hen that has just laid an egg, and crowing exactly like a cock, "apparently enjoying the sound of the responses made by the fowls of the neighbouring farmyard."

THE RING OUZEL (*Turdus torquatus*), which is nearly allied to the Blackbird, is one of the largest species of this family, measuring about eleven inches in length. The colour of its plumage is brownish-black, and across the breast there is a distinct white band. Unlike any of the preceding species, the Ring Ouzel is a summer bird of passage in this country and in the north of Europe generally; its winter quarters being in the most southern parts of the European continent, and in the north of Africa. In this country the Ring Ouzel resides and breeds in the rocky and mountainous districts, building a nest somewhat similar in its construction to that of the other thrushes, on the ground, under shelter of a stone or bush, or amongst the heath. In its food and general habits it resembles the Blackbird.

Besides the preceding, two other species of the genus *Turdus* have been met with in Britain, namely, WHITE'S THRUSH (*T. Whitei*), a Japanese species, and the GOLD-VENTED THRUSH (*T. auriventer*), a native of Africa.

THE RED-BREASTED THRUSH (*Turdus migratorius*), called the ROBIN in the United States of America, is about the size of our Song Thrush, and is of an ash colour above, with the head, wings, and tail black, the throat black, and the breast dark orange. This bird resides in immense flocks during the winter in the maritime states of the Union, migrating in the spring to the higher regions of the interior. The nest is usually placed in an apple-tree, and is plastered in the inside with mud, like those of our British thrushes. The female lays five eggs of a delicate sea-green colour.

THE WOOD THRUSH (*Turdus melodus*), another American species, resembles our Song Thrush in its colouring, as also in the sweetness of its song. It is found in all parts of the North American continent, but migrates to the south for the winter. Its usual resorts are shady hollows, and it is of a shy and solitary disposition, being usually seen either singly or in pairs. The nest is built in a bush, and composed externally of a large quantity of dead beech leaves, within which is a cup formed of dry grass and mud, smoothly plastered and lined with the fine fibrous roots of plants. The eggs are four or five in number, and of a uniform light blue colour.

THE MOCKING BIRD (*Mimus polyglottus*)—Plate 10, fig. 34—the most celebrated of the American thrushes, is found not only in the United States, but also in the West Indies and South America, being stationary in the warmer regions, but migratory, or partially so, in the colder. It is between nine and ten inches in length; the plumage of the upper parts is brownish-ash colour, with the wings and tail nearly black; the lower parts are brownish-white. The Mocking Bird is found principally in the woods of low districts, where it feeds upon the berries which grow in profusion on the luxuriant thickets of the swamps, and also upon insects, which it often captures on the wing with great dexterity. The nest is placed in a thick bush or tree, and is usually composed of twigs, straws, dry grass, wool, and tow, and lined with a layer of fine fibrous roots; the eggs are generally four in number, of a grayish-blue colour, with large brown patches. During the season of incubation, the male attacks every creature that approaches the nest, exhibiting a particular animosity to the black snake, which, as Wilson tells us, is "the mortal enemy of his eggs and young." "Whenever," says Wilson, "the insidious approaches of this reptile are discovered, the male darts upon it with the rapidity of an arrow, dexterously eluding its bite, and striking it violently and incessantly about the head, where it is very vulnerable. The snake soon becomes sensible of its danger, and seeks to escape; but the intrepid defender of his young redoubles his exertions, and, unless his antagonist be of great magnitude, often succeeds in destroying him." After a victory of this kind, the bird places himself on the top of the bush containing his nest, and pours forth a perfect torrent of song, and this, from its power and wonderful variety, is described as equal to that of any other bird, not even excepting the nightingale. Like that charming English songster he sings both by day and night, and at the latter season his melody is described as "making the whole neighbourhood ring." But the most remarkable point connected with the vocal performances of this bird, consists in his wonderful power of imitation, the notes and cries of almost every bird or animal being mixed up with his own proper song in the most extraordinary manner. "In his domesticated state," says Wilson, "when he commences his career of song, it is impossible to stand by uninterested. He whistles for the dog; Cæsar starts up, wags his tail, and runs to meet his master. He squeaks out like a hurt chicken, and the hen hurries about with hanging wings and bristled feathers, clucking to protect its injured brood. The barking of the dog, the mewing of the cat, the creaking of a passing wheelbarrow, follow with great truth and rapidity." The songs and notes of other small birds are also imitated, and even improved upon by the Mocking Bird; and so perfect are the imitations of this incomparable mimic, that he not unfrequently deceives the sportsman, and even the birds themselves whose note he borrows." This fondness for imitation cannot but impair the beauty of the bird's song, and yet Wilson seems to think that it constitutes one of its chief excellencies, "as these changes give a perpetual novelty to his strain, keep attention constantly awake, and impress every hearer with a deeper interest in what is to follow."

THE CAT BIRD (*Mimus felivox*), which is nearly allied to the preceding, owes his name to the singular note, resembling that of "some vagrant orphan kitten bewildered amongst the briers," which he is fond of uttering. He is a bird of passage in the United States, in the southern parts of which he arrives as early as the end of February; he takes up his abode in the thickets, and feeds both upon insects and fruits, resorting to the gardens in search of the latter. The nest is placed in a thick bush, and resembles that of the Mocking Bird in its construction.

THE WHITE HEADED BABBLER (*Malacocercus griseus*), an inhabitant of India, is rather less than our blackbird, and is of a gray colour, with the crown of the head and back of the neck white, and the lower surface tinged with red. It is an abundant and sociable bird, dwelling in hedges, groves, and gardens, and seeking its food, which consists principally of insects and worms, on the ground, where it is seen turning over the dead leaves, and even searching heaps of dung, whence the name of *Dirt-bird* is given to it by the English in India. This bird has no song.

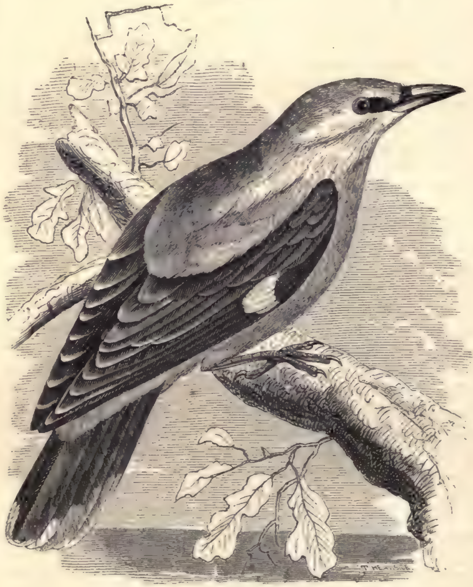
THE LAUGHING THRUSH (*Pterocyclus cachinnans*), another Indian species nearly allied to the preceding, is especially abundant in the thick woods which clothe the Neilgherries, where it is usually seen among the lower branches of the trees, but appears rarely to alight on the ground. Its food consists principally of fruits, varied with catterpillars and other soft-bodied insects. It is a noisy bird, and its name is derived from its peculiar cry, which is described by Mr. Jerdon as "a sort of cracked Punch and Judy laugh."

THE BLACK-FACED BABBLER (*Garrulax chinensis*), a native of China, where it is known by the name of *Shanhu*, is about the size of the common blackbird, and of an olive brown colour above, gray beneath, with the orbits, chin, and throat black. It is an inhabitant of the woods, and is a good songster; also imitating almost every sound that it hears. Its food consists of insects and other small animals, and in confinement it has even been known to kill a snake of a foot in length by striking it through the head with its bill.

THE WHITE EYE-BROWED THRUSH (*Pomatorhinus superciliosus*). This bird, which is an inhabitant of the whole southern portion of Australia, is described by Mr. Gould as the most restless, noisy, and querulous bird that he ever encountered. It runs and hops about amongst the branches of the trees uttering a "jarring, chattering, and discordant jumble of notes, which are sometimes preceded by a rapidly repeated shrill piping whistle." These birds are usually met with in small flocks of from six to ten in number; they feed upon the ground under the trees, and when disturbed fly up to the lowest branch, and then go off in a line to the top of the tree, whence they usually flit to another. The nest is a large domed structure of dried sticks, with the entrance at one side.

THE SPOTTED GROUND THRUSH (*Cinclosoma punctatum*), another Australian species, is found only in the eastern part of New Holland, and in Van Diemen's Land. Its favourite haunts are stony hills and rocky gullies, where it runs about with great rapidity, its power of flight being very small. In Hobart Town, where it is highly esteemed for the table, it is known as the *Ground Dove*. The food of this bird consists of seeds and caterpillars. Its nest is slightly constructed of leaves and the bark of trees; it is placed on the ground under the shelter of a stone or tuft of grass, and contains two or three eggs of a white colour, with olive-brown blotches.

Fig. 111.



The Golden Oriole (Oriolus galbula).

THE GOLDEN ORIOLE (*Oriolus galbula*)—fig. 111—is a common bird in the southern parts of the European continent, where, however, it is a summer visitor, and specimens occasionally find their way into Britain. It frequents secluded woods and the borders of forests, living sociably in small parties, and feeding partly upon caterpillars and other insects, and partly upon fruits. The nest is cup-shaped and rather flat, placed upon the horizontal forked branch of a tree, and composed of long grass and wool, carefully and ingeniously interwoven. The eggs are generally four or five in number, of a purplish white colour, with a few gray and reddish spots. The Golden Oriole is rather more than nine inches in length. The general colour of the plumage in the male is bright yellow, with the wings and tail black, more or less variegated with yellow, and with a dark streak running from the bill to the eye; the female is olive-coloured above, grayish-white beneath, with the wings and tail brown.

THE RED-VENTED BULBUL (*Pycnonotus hæmorrhoüs*), one of the most abundant of Indian birds, is of a brownish colour above, with the head and tail black, and whitish beneath, with the vent red. The head exhibits the appearance of being crested. This bird is found either in pairs or in small flocks in gardens, fields, and jungle, but always in open parts of the latter; it feeds principally on fruits and insects, and is occasionally destructive to peas in gardens. It is often kept in confinement for the purpose of fighting, for which it exhibits considerable aptitude; the combatants seizing each other by the red feathers of the vent, and endeavour to pull them out. When caged it is said to imitate the notes of other birds.

THE JOCOSE BULBUL (*Pycnonotus jocosus*), a species nearly allied to the preceding, and like it a native of India, is a sprightly bird, which is found both in woods and gardens. It is active and lively, always on the move, and warbling its pleasant chirping notes, which are far sweeter than those of the preceding species. The food of this species consists chiefly of fruits and seeds, but it also eats insects. It is a favourite with the Hindoos, who train it to sit upon the hand, and carry it about with them to their bazaars and other places of resort.

THE CAYENNE ANT-THRUSH (*Formicarius cayanensis*). This bird is an example of a peculiar group of Thrushes inhabiting the tropical regions of both hemispheres, which are especially organised for a terrestrial existence, having the wings and tail short, and the tarsi long and well-developed. They are called Ant-thrushes from their fondness for ants, which, with other insects, constitute their nourishment. The Cayenne Ant-thrush measures about eight inches in length; it is of an ash colour above, and whitish beneath, with the wings black. It dwells principally on the ground, where it busily turns over the dead leaves in search of insects, and runs with great ease.

THE KING ANT-THRUSH (*Grallaria Rex*), another South American species, has the tarsi longer than in the preceding, so that some of the older writers seem to have hesitated whether to regard it as a gallinaceous bird. It inhabits the forests, where it runs upon the ground and destroys great quantities of white ants. It is generally seen solitary, and rarely perches on trees.

THE BENGAL PITTA (*Pitta bengalensis*). Of the species of the group of Ant-thrushes inhabiting the Old World, those of the genus Pitta, some of which are abundant in the East Indies, are distinguished by the beauty of their plumage. The Bengal Pitta is green above, yellow beneath, with the head and neck black, streaked with white and orange, and the quill feathers of the wings and short tail black. It is found in gardens and groves, usually in small flocks, feeding on the ground, principally upon beetles.

THE GIANT PITTA (*Pitta cærulea*), a native of Sumatra, one of the largest species of this group, measures about nine inches in length, and is of a brilliant blue colour above, with the top of the head, a collar, and the quills of the wings black; the throat is whitish, and all the rest of the lower surface has a brownish tint.

THE HILL BLACKBIRD (*Myiophonus cæruleus*), a common bird on the Himalayas, is of a metallic blue-black colour; and, from this and its fine song, it has been compared by the English residents in India with our Blackbird. Its musical whistle is said by Mr. Vigne to be the sweetest note heard in the hills. Its nest is built upon the ledges of some nearly inaccessible rock, and is composed of moss and lichens, lined with fine roots. In its habits this species greatly resembles the European Blackbird.

THE WATER OUZEL (*Cinclus aquaticus*), sometimes called the *Dipper*, is now generally regarded as being most nearly allied to the Ant-thrushes and Pittas, notwithstanding the peculiarity of its habits and mode of life. This singular bird, which is an inhabitant of Europe, and is found not uncommonly in this country, is about eight inches in length, of a dark grey colour above, with the head and neck brown; and brownish-red beneath, with the throat white. It resides in the vicinity of water, exhibiting a decided preference for the clear streams and lakes of mountainous districts; and it is in the water, and not on its banks, that the bird seeks its food. The older naturalists supposed that this bird walked into the water, carrying down with it a supply of air for respiration during its submersion; but the impossibility of this is proved by the fact that the bird does not walk even on land, whilst the lightness of its body would prevent its either walking or hopping at the bottom of the water. From the observations of the late Mr. M'Gillivray, it would appear that the aquatic progression of the Water Ouzel is effected by the agency of the wings; the bird actually flying under water, as is the case with many of the short-winged swimming birds. On rising to the surface, the Water Ouzel swims well, and can dive again without rising from the water. The food of this bird consists of aquatic mollusca and insects, and perhaps also of the spawn and young of fishes. The nest is made of moss, completely domed over, so as to have only a small aperture for the ingress and egress of the bird. It is placed in some convenient situation about the bank of the stream or lake, and contains five or six pure white eggs. The birds rear two or three broods in the year.

FAMILY III.—MUSCICAPIDÆ.

The birds of this family are characterized by having a rather short but broad and depressed bill, with the gape very wide, running back nearly as far as the eyes, and fringed on each side at the base with long and strong bristles springing from the upper mandible. In these respects they present a certain amount of resemblance to the fissirostral birds, as also in the small development of the legs, which are generally short and slender. Their wings are generally long.

These birds are generally of small size, and strictly insectivorous in their habits, although some of the larger species of the family kill and devour the smaller vertebrate animals. The English name of *Flycatchers* applied to the best known species, indicates that these feed principally upon flying insects, and may also be regarded as indicating the mode in which the typical species of the family capture their prey. The birds are in the habit of perching upon some post or rail, or on the branch of a tree, watching for the passage of insects, in pursuit of which they immediately dash off, returning again to their original position when the capture is effected, there to look out for more. This mode of feeding is, however, by no means universal in the family, nor is it peculiar to the birds of this group. We have already had occasion to notice the prevalence of the same habit in several insectivorous birds; and the writer has even seen it practised by the common house-sparrow.

THE SPOTTED FLYCATCHER (*Muscicapa griseola*) —Plate 10, fig. 35.—Of the typical genus of this family we have two British species, and of these the Spotted Flycatcher is by far the most abundant. It is a summer visitor to this country, and one of the latest in arriving here, usually making its appearance in the south about the 20th of May; but, in the course of the summer, it diffuses itself very generally over the whole island, and may be seen almost everywhere taking up its position of observation upon a post or paling, and performing its short irregular flights in pursuit of passing insects. This bird is sometimes accused of devouring cherries and raspberries, but probably without cause; its object in visiting these fruits, when ripe, being no doubt to feed upon the flies which are attracted by them, as no remains of fruit have ever been found in its stomach.

The nest of this bird, which is supposed to be generally made by the female alone, is usually placed in the side of a faggot stack, a hole in a wall, or upon a beam in some outhouse, but sometimes in trees, especially when trained against a wall. The bird sometimes, however, chooses singular situations in which to construct her dwelling; one nest has been built upon the head of a garden-rake left accidentally standing against a wall; another in a bird-cage; another, recorded by Mr. Atkinson, on the angle of a lamp post in one of the streets of Leeds; and another, mentioned by both Jesse and Yarrell, in a still more remarkable place—namely, within the crown on the top of one of the lamps in Portland Place in London. The nest is cup-shaped and neatly constructed of moss, roots, and grass, usually lined with hair, wool, and feathers. The eggs, which are four or five in number, are of a bluish-white colour, with pale red spots.

THE PIED FLYCATCHER (*Muscicapa atricapilla*), which is also a summer visitor to Britain, is comparatively a rare bird in this country, and is most abundant in the lake district of Cumberland and Westmoreland. It is rather a smaller bird than the preceding, measuring little over five inches in length; the male is black above and white beneath, with a spot above the base of the bill, the outer webs of the tertial wing feathers, and of a portion of those of the tail white; the female is brown above and dull white beneath, and is destitute of the white spot on the forehead. In its general habits this bird resembles the Spotted Flycatcher; but its nest, which is loosely made of grass and roots, is placed in the hole of a decayed oak or other pollard tree. The eggs, of which these are sometimes as many as eight in one nest, are of a uniform pale blue colour.

THE AMERICAN REDSTART (*Setophaga ruticilla*).—This bird, which is a summer visitor to the United States, has received the name of Redstart from its resemblance to the European birds so called, although its characters and habits are very different. It is nearly allied to the preceding species; the total length is about five inches; the colour of the plumage on the back, head, neck, and the upper part of the breast is black; the wings have a broad orange band across them, and the quills from thence to the tip are brownish; the belly is white; the four middle feathers of the tail are black, and the remainder orange with black tips. The female is of an ashy-olive colour above, and dull white beneath; she wants the orange band across the wing, and has the middle tail feathers brown, and the others greenish-yellow.

This bird, according to Wilson, is one of the most expert of Flycatchers. It will pursue "a retreating party of flies from the tops of the tallest trees, in an almost perpendicular, but zigzag direction, to the ground, while the clicking of its bill is distinctly heard;" and Wilson adds that it no doubt secures ten or twelve flies in a descent of three or four seconds. Its nest is built in a low bush, where it is attached to two twigs; it is composed of flax moistened with the saliva of the bird, and lined with soft down. The eggs are white, speckled with gray and black.

THE PARADISE FLYCATCHER (*Tchitrea paradisi*).—This elegant species is found in all parts of India and in Ceylon. The male measures about twenty inches in length; but two-thirds of this is due to the great elongation of the two middle feathers of the tail, which are about fifteen inches long; these long feathers are wanting in the female. The head, which is adorned with a small pointed crest, and the neck are greenish-black; the body is white, and the wings and tail streaked with black. It is abundant in the woods and dense jungle, and is restless in its habits, feeding upon insects, which it captures in the air as it flits about, making a loud snap with its bill as it seizes its prey.

THE BLACK FAN-TAILED FLYCATCHER (*Rhipidura motacilloides*).—This bird, which is distributed over all parts of the Australian continent, is remarkable for its long and broad tail, which it spreads out into a fan, thus acquiring an elegant appearance. It is of a glossy black colour, with the wings brown, the lower surface, except the throat, and a small streak over each eye, pure white. It is a lively, active, and familiar bird, haunting the neighbourhood of the houses, and seeking for its insect food, not only in the gardens, but also about the cattle, upon the backs of which it will frequently alight and run along. Much of its prey is sought on the ground; then its appearance resembles that of the European Wagtails; like them, it has the habit of shaking its tail, but the movement is from side to side, and not perpendicular. It constructs a beautiful cup-shaped nest of dry grass, roots, and strips of bark, held together by cobwebs, and usually rears two or three broods in the season.

THE WHITE-BROWED FLYCATCHER (*Rhipidura albofrontata*), a nearly allied Indian species, is common in the northern parts of the peninsula of Hindostan, where it frequents both the jungle and gardens. It captures much of its food upon the wing, but, like its Australian relative, is sometimes seen perched upon the backs of cattle. Mosquitoes constitute a great portion of the diet of this bird, and hence one of its Indian names signifies "Mosquito-catcher."

THE RESTLESS FLYCATCHER (*Seisura volitans*) is an abundant species in all the southern parts of Australia, where it is known to the colonists as the "Grinder," or the "Razor-grinder," from a remarkable noise which it emits while engaged in the pursuit of its prey. It feeds on insects, which it not only captures in the air in the ordinary manner of the Flycatchers, but also by flying over the fields, with regular beats of the wings, like the Kestrel, and dropping perpendicularly upon any insect which it perceives beneath it. The flight of the bird is described as peculiarly graceful, forming a striking contrast to the harsh grinding note uttered by the bird. Mr. Gilbert seems to think that this note is emitted for the purpose of attracting the notice of the insects below; for he observed, that, after uttering the cry, the bird always descends to the ground, picks up something, and carries it off to the nearest tree.

The Restless Flycatcher is about eight inches in length. The plumage is black above, and white beneath, and the breast often exhibits a pink tint. The nest is cup-shaped, neatly made of fine grasses held together by cobwebs, and lined with fine roots, and sometimes a few feathers.

THE WHITE-EYED FLYCATCHER (*Vireo noveboracensis*), is a common summer bird in the United States of America, where it arrives rather early in the year from its winter haunts in the West Indies and tropical America. It is rather more than five inches in length, the plumage of the upper parts is yellowish-olive, of the lower surface white, with the sides of the breast yellow; round each eye is a yellow line, and near each nostril is a spot of the same colour. This flycatcher is an active, lively, and sociable little bird, possessing a strong voice, and a song of considerable variety. It builds a neat nest in the form of an inverted cone, suspended by the upper edge; the materials of which the nest is composed, are fragments of rotten wood, dry stalks, and similar articles, and it is remarkable that, amongst these, pieces of paper are almost always found, Wilson says that the bird exhibits so great a predilection for fragments of newspapers, that some of his friends gave it the name of the Politician. The materials of the nest are held together with the silk of some caterpillars, and the lining consists of fine dry grass and hair.

THE RED-EYED FLYCATCHER (*Vireo olivaceus*). This and the preceding species belong to a small group of Flycatchers peculiar to America, and to which the name of *Greenlets* has been given, from the prevalence of green or olive tints in their plumage. Like the preceding it is a summer visitor to the United States, whilst its winter is passed in warmer latitudes; it is a well-known bird in Jamaica, where it is called, "Whip Tom Kelly," from a fancied resemblance in its song to those words. Wilson says that by listening attentively for some time to the note of this bird, it requires little imagination to fancy that it pronounces the words—"Tom Kelly, Whip Tom Kelly," very distinctly, but Mr. Gosse dissents from the general opinion, and says that the notes resemble the syllables, "John-to-whit," the last syllable pronounced with emphasis.

The Red-eyed Flycatcher is a little larger than the preceding species; its general colour above is yellowish-olive, beneath white; a white line runs from the nostril over the eye, which has a red iris. The nest of this species is likewise conical in form, and paper is one of its constant materials. Both these species are frequently selected by the Cow-bird, as foster parents to its offspring.

THE YELLOW-BREASTED FLYCATCHER (*Icteria viridis*), another nearly allied American species, is larger than either of the preceding, measuring seven inches in length. Its plumage is of a fine olive-green colour above, and white beneath, with the throat and breast of a brilliant yellow. During the period of incubation, the male of this bird behaves in a most extraordinary manner, uttering loud cries and ascending and descending in the air with a singular dancing motion. He exhibits the greatest jealousy of any intruders on the thicket which he has selected for his residence, "scolding any passenger," says Wilson, "as soon as they come within view, in a great variety of odd and uncouth monosyllables." The nest, for the protection of which all these exertions are made, is usually placed in a bramble bush in the midst of some impregnable thicket, and composed externally of dry leaves, within which is a layer of strips of vine bark, and an inner lining of fibrous roots and fine grass.

THE TYRANT FLYCATCHER (*Tyrannus intrepidus*), which is also called the KING-BIRD, is an example of another American group of Flycatchers. In these birds the bill is larger and stronger than in the ordinary Flycatchers, indicating an approach to the Shrikes.

The Tyrant Flycatcher is about eight inches in length, the plumage of the upper parts is slaty ash-colour, with the head and tail black, the feathers on the former being capable of elevation, so as to form a sort of crest, when a subjacent bed of a brilliant orange colour is displayed, which is commonly called the crown of the King-bird. The lower surface is white.

The names of King and Tyrant bestowed upon this bird, refer to the extraordinary authority which he arrogates to himself during the breeding season, over all the rest of the feathered creation. At this period, as described by Wilson, "his extreme affection for his mate, and for his nest and young, makes him suspicious of every bird that happens to pass near his residence, so that he attacks without discrimination any intruder. In the months of May, June, and part of July, his life is one continued scene of broils and battles; in which, however, he generally comes off conqueror. Hawks and crows, the bald eagle, and the great black eagle, all equally dread a rencounter with this dauntless little champion, who, as soon as he perceives one of these last approaching, launches into the air to meet him, mounts to a considerable height above him, and darts down on his back, sometimes fixing there to the great annoyance of his sovereign, who, if no convenient retreat or resting-place be near, endeavours by various evolutions to rid himself of his merciless adversary. But the King-bird is not so easily dismounted. He teases the eagle incessantly, sweeps upon him from right and left, remounts, that he may descend on his back with the greater violence; all the while keeping up a shrill and rapid twittering, and continuing the attack sometimes for more than a mile, till he is relieved by some other of his tribe, equally eager for the contest." The only bird which appears to get the better of the King-bird in these encounters is the Purple Martin, whose determined enmity to all birds of prey is somewhat like his own. The power of wing possessed by the martin is so great, that the King-bird has little chance of touching him, and occasionally the attacked party becomes the attacker, when the King-bird is compelled to seek safety in an ignominious flight, before the rapid and easy swoops of his assailant. Wilson says that he has also seen the King-bird greatly irritated by his vain efforts to dislodge the Redheaded Woodpecker, the latter dodging him round a rail, and appearing highly amused at the impotent rage of his assailant. This quarrelsome demeanour is laid down by the King-bird at the close of the breeding season, and he then becomes a peaceable denizen of the wood or the orchard.

This bird arrives in the United States from his winter quarters about the month of April, generally in small parties of five or six. The nest is built on the branch of a tree, and composed of small twigs and dried flowers, interwoven with tow and wool, and made very compact. The lining consists of fine grass and horsehair. The eggs, which are usually five in number, are cream-coloured, with a few large purple spots and small pale brown ones, principally at the larger end.

The only song of this bird is a shrill twitter. His food consists principally of insects, which he captures, sometimes by flying steadily over the fields, and dashing down upon them as they pass below him, and sometimes in the manner of the ordinary Flycatchers, by taking his position on the summit of a post or tall weed, and sweeping off after them as they pass. Under the latter circumstances, he is observed to exercise a certain amount of discrimination in selecting his prey, often allowing two or three insects to fly by him, before he makes his dash. This has been repeatedly noticed in the case of bees, a species of food to which he is partial, and his fondness for which often leads to his destruction by the owners of the hives; when he takes up his position to watch a bee-hive, he is seen evidently to select certain individuals from the crowd of passers in and out.

THE CRESTED TYRANT (*Tyrannus crinitus*) is a little larger than the preceding species, which it resembles in its general habits, but does not attack birds of prey in the same way. This bird builds its nest in the hole of a tree, constructing it of hay, feathers, and hairs, with fragments of cast snake's skin; the latter, according to Wilson, being always present.

THE PIED ALECTRURUS (*Alectrurus tricolor*). This bird is remarkable among the Flycatchers for having the tail feathers elongated and vertical, forming a tail like that of a cock, from which the generic name is derived. The present species, which is a native of tropical South America, is nearly six inches in length, and is pied with black and white, but with the back ash-colour. It generally inhabits the vicinity of water, flies lightly, and perches upon rushes and other aquatic plants, and not upon the branches of trees. The male sometimes rises nearly perpendicular to a height of thirty or forty feet by rapid beats of his wings; when thus engaged, he looks more like a large black and white butterfly than a bird.

FAMILY IV.—AMPELIDÆ.

In the birds of this family, which are often called *Chatterers*, the notches characteristic of the dentirostral birds, although small, are always distinctly to be seen on each side of the tip of the bill, which is rather short, and broad and depressed at the base, so that when viewed from above it is clearly triangular. The ridge of the upper mandible is more curved than in the preceding families. The wings in these birds are generally long, and the tail short; the feet are slender, and the toes are terminated by curved, acute claws, grooved along their lower surface.

Most of these birds are met with in the warmer regions, where they feed both upon insects and fruits. Their plumage is often very beautiful, and brilliant in its colouring.

THE BOHEMIAN CHATTERER (*Bombycilla garrula*). Although as already stated, the majority of the birds of the present family are found in hot countries, there are some, forming the genus Bombycilla, which dwell in the cold regions of the north; amongst these the Bohemian-chatterer is the best known. During the summer this bird inhabits the northern parts of both continents, but migrates southwards at the approach of winter, at which season it is not unfrequently seen in this country.

It is a gay and handsome bird, of a light brown colour above, paler beneath; the face and chin are deep black, and the top of the head is adorned with a crest of elongated light brown feathers, which the bird can erect at pleasure; the feathers of the short tail are grey with bright yellow tips, and the quills of the wings black spotted with yellow. Four of the secondary quills, and a portion of the tertials, are terminated by small flat palettes of a bright red colour, exactly resembling portions of red sealing-wax attached to the extremity of the shaft of each feather; from these the bird has received the appropriate name of the *Waxwing*.

The Bohemian Chatterer, or Waxwing, is an active and lively bird, generally haunting the hedges in this country, and feeding on the berries of the hawthorn, mountain ash, and ivy. In North America, according to Sir John Richardson, it makes its appearance, coming from the south, at the Great Bear Lake about the end of May, when it feeds upon the berries of the arbutus, cranberries, and other fruits, then just exposed by the spring thaw. Its breeding places appear to be the rugged mountain districts of high latitudes, where its food consists principally of the berries of the juniper. In default of fruits, it is said sometimes to feed on insects, which it captures dexterously in the air in the manner of a Flycatcher. Its note is a frequently repeated chirp.

THE CEDAR BIRD (*Bombycilla carolinensis*), a species nearly allied to the preceding, is peculiar to the North American continent, in all parts of which, from Mexico to Canada, it is to be met with. It appears to migrate only from one part of the country to another in search of an abundance of its favourite food, the berries of the red cedar. It also feeds upon other berries, and is said to evince a decided partiality for cherries when in season. The nest of this species is built in a tree, usually in an orchard. It is composed of grass, and generally contains three or four eggs of a bluish-white colour spotted with black.

THE BLUE-RIBAND COTINGA (*Ampelis Cotinga*). The Cotingas, forming the typical genus of this family, are all inhabitants of the tropical parts of South America, of which they are amongst the most brilliant birds. They live in the forests, generally on the shores of the small rivers and in marshy places, and feed principally upon insects. The Blue Riband is of a fine azure-blue colour, with the throat, breast, and upper part of the belly of a beautiful purple; an azure band separates the purple of the breast from that of the belly, and from this the name of the bird is derived. The female of this, as of the other species, is far more sober in her colouring.

THE POMPADOUR COTINGA (*Ampelis Pompadora*), so called from its having been introduced into France for the celebrated mistress of Louis XV., is one of the most beautiful of American birds, its whole plumage being of a bright carmine colour, with the exception of the wing-quills, which are white; the wing-coverts are elongated, stiff, and slender, and so placed as to cross the quills.

THE CAPPED MANAKIN (*Pipra pileata*). The Manakins, which are, like the preceding, inhabitants of the forests of tropical South America, are also beautiful little birds of great liveliness and activity, so that they have been regarded by one writer as personifications of perpetual motion. Most of them are very small, and as they are in incessant action upon the branches of trees and shrubs, searching for the insects which constitute their food, they present no distant resemblance to the little blue Tits of our own country. Small fruits also constitute a portion of their diet. The Capped Manakin is of a fine cinnamon-brown colour above, yellow beneath; the crown of the head is covered with black feathers, which are capable of being raised so as to form a sort of crest, and over each eye is a yellow streak. The quill feathers of the wings are black.

THE RED-HEADED MANAKIN (*Pipra rubro-capillata*) is of a deep lustrous black colour, with the head orange red; and the WHITE-HEADED MANAKIN is also black, with the head pure white. The BLUE-HEADED MANAKIN is olive-green above, with the head blue and the rump yellow; the lower surface is yellow, and the quill feathers are black. All these species are little more than three inches in length.

THE RED CHATTERER (*Phœnicocercus carnifex*), although a much larger bird than the preceding species, is nearly allied to them, and like them inhabits the damp forests of Brazil and Guiana. It is about seven inches in length, and the male is a magnificent bird, with plumage of a fiery-red colour, except the upper part of the back, which is reddish-brown, and the breast, which is blood red; the tail feathers are crimson with black tips.

THE ORANGE COCK OF THE ROCK (*Rupicola aurantia*)—Plate 11, fig. 36—which is also allied to the Manakins, is considerably larger than even the preceding species, being about the size of an ordinary pigeon. The plumage is of a bright orange colour; the head is adorned with a crest formed by two flat plumes of feathers so inclined as to touch by their edges, where they are finely bordered with brown and bright yellow. The wings are brownish, marked with white at the bend and in the middle, and the tail feathers are blackish-red margined with yellow. The bird is supported upon stout legs and feet, having some resemblance to those of a gallinaceous bird, and with these he is said to scratch in the ground like a fowl. The Cock of the Rock is a native of tropical South America, where it dwells amongst the rocks bordering the mountain streams, and breeds in the numerous caverns with which the mountains of South America abound. The nest is composed of bits of stick and dry grass, and the female lays two white eggs about the size of those of a pigeon. The food of this bird consists of insects and small wild fruits. A nearly allied but distinct species (*Rupicola peruviana*) inhabits the mountains of Peru and Mexico.

THE GREEN CALYPTOMENA (*Calyptomena viridis*). This bird, which is generally regarded as nearly related to the Rock Cocks, is remarkable, not only for the beauty of its plumage, but also for being the only species of the small group to which it belongs, which is found out of America. It is an inhabitant of Singapore and Malacca, where it resides in the heart of the forests and feeds upon vegetable matters, principally fruits and seeds. Its length is about six inches and a half, and the male is of a most beautiful green colour, with some black spots on the head, and three black bands on the wings, of which the primary feathers are blackish-brown. The tail feathers are green above and blue-black below. The feathers of the head are directed forwards, so as almost to conceal the bill, which is depressed and broad at the base.

THE YELLOW BUD-HUNTER (*Leiothrix luteus*). This is a common Indian species of a small group which resembles the Tits in some respects, and especially in the habit of minutely examining the buds of trees in search of small insects. It is found abundantly in Upper India, and migrates to the hills during the hot season. Its food consists partly of insects and partly of fruits and seeds.

THE THUNDER BIRD (*Pachycephala gutturalis*). This species is a native of the whole southern part of Australia, where it is abundant in the forests of Eucalypti and Acacias. It measures about seven inches in length; the male is olive-coloured above, and bright yellow beneath, with the head and a band across the front of the neck black, and the throat white. The female is greyish-brown. The food of this species consists of insects.

THE BANDED THICK-HEAD (*Pachycephala pectoralis*) resembles the preceding species in the arrangement of its colours, but has the lower surface reddish-buff instead of yellow. It is found over the whole southern part of the Australian continent, dwelling amongst the leafy branches of tall trees in the thinner parts of the forests. Its song is animated and lively, being described by Mr. Gould as a "loud, continuous, ringing whistle, frequently terminating in a sharp smack," like that of a whip, which is also a characteristic note of the two preceding species.

THE YELLOW ROBIN (*Eopsaltria australis*). The bird which is known under this name by the colonists of New South Wales, is an abundant species in the brushes of that country, and also frequently makes its appearance in the gardens. It is a lively and sprightly bird, presenting a considerable resemblance to the robin in its actions. The whole length of the bird is about six inches; its colour is gray above, with the rump yellow; beneath bright yellow with the chin white. It breeds in September and October, building a beautiful cup-shaped nest upon the forked branch of a tree; this is composed of strips of bark, roots, and sometimes grasses, held together outside by cobwebs, to which fragments of lichen and bark are often attached so naturally, as to render the detection of the nest almost impossible. The eggs are of a bright green colour spotted with brown.

THE SPOTTED PARDALOTE (*Pardalotus punctatus*), the DIAMOND BIRD of the colonists of New South Wales, is common over the whole of the southern part of the Australian continent and in Van Diemen's Land. It is an active, sprightly, and beautiful little creature, measuring only a little more than three inches and a half in length to the extremity of its short tail; the male has the head, wings, and tail black, with a pure white spot at the tip of each feather, and a white streak over each eye; the sides of the neck gray; the feathers of the back fawn colour, edged with black, and gray at the base; the rump reddish-brown, with the upper tail coverts crimson; and the whole lower surface yellow, the throat especially being of a very bright orange-yellow. The female is less brilliantly coloured. This bird frequents both the forests and gardens, where it is constantly to be seen amongst the branches of the trees, clinging in every possible position, whilst busily engaged in seeking its insect food amongst the foliage. It is remarkable on account of the situation which it selects for its nest; for whilst the other species of this genus build in the holes of trees, the Spotted Pardalote descends to the ground for this purpose, digs a horizontal gallery two or three feet in length into some bank, and at the end of this forms a chamber in which the nest is made. The nest is very neatly constructed of strips of the inner bark of the gum trees; it is of a nearly spherical form, with a hole for entrance at one side. The bird rears two broods in the season, laying four or five pure white eggs.

THE STREAKED PARDALOTE (*Pardalotus striatus*) is another species which enjoys a wide distribution over the south of Australia; it has not yet been met with in Van Diemen's Land. It does not exhibit the pure white spots which give so much beauty to the plumage of the preceding species, and its lower surface is of a paler yellow. Its nest is neatly made of soft grasses and strips of bark, and placed in the hollow branch of a tree, or sometimes in a hole of the trunk.

THE WHITE-SHOULDERED CATERPILLAR-EATER (*Campephaga humeralis*), another Australian species of this family, is a summer visitor to the south of New Holland, in all parts of which it is common from September to January. It is active and lively, and has a pleasing song, which it emits constantly during its search for food; this consists of insects, which it captures on the wing, on the branches of trees, and on the ground. The nest of this bird is small and cup-shaped; it is composed of fragments of bark, short twigs, and grasses, interwoven with other fine vegetable fibres, moss, and cobwebs; it is placed on the forked branch of a tree, and so arranged that it is not easily detected from below. The whole length of the bird is about seven inches. The two sexes differ greatly in colour. The male has the upper parts black, with the rump gray, and the lower parts white; the shoulders and upper wing-coverts are white, forming a broad band along the wing. The female is brown above, and buffy white beneath. The bill and feet are black, or blackish in both sexes, palest in the female. Several other species of this genus are found in Australia.

THE GRAY CATERPILLAR-EATER (*Campephaga fimbriata*), an inhabitant of the woods of India, is about the same size as the preceding species; it is of a slate colour, with the head, wings, and tail black, the latter bronzed; and the tail has a gray spot at the tip of each of the outer feathers. The principal food of this species is caterpillars, grubs, and other soft wingless insects; but it also feeds on winged and even hard-shelled insects, and on berries and seeds.

THE BLACK CATERPILLAR-EATER (*Campephaga nigra*), one of the best-known African species, is common at the Cape of Good Hope. It is about seven inches long, and is of a shining metallic black colour, with the lower wing-coverts green.

THE LOBED CATERPILLAR-EATER (*Campephaga lobata*), which is an inhabitant of Sierra Leone and other parts of the west coast of Africa, is remarkable for having a large, red, naked wattle at the base of the bill in the male.

THE CRIMSON-RUMPED CHATTERER (*Pericrocotus peregrinus*), an abundant species in India, is about six inches in length, of a gray colour above, with the rump crimson, and white beneath; the wings are brown, and the tail black, with the tips of the four middle feathers yellow. This bird is met with in the jungle, and in hedges and groves of trees; it is restless, lively, and active, resembling a Tit in its habits; it feeds on insects, especially larvæ, which it captures on the trees.

THE FLAMMEOUS CHATTERER (*Pericrocotus flammeus*) is another Indian species, of which the male is splendidly adorned with black and orange plumage. It is abundant in the jungles, and ascends the mountains to a considerable elevation. It is seen in small parties of three or four at the tops of the high trees, frisking about and picking the insects off the twigs and leaves, or occasionally capturing them in the air.

THE MURASING CHATTERER (*Artamus fuscus*) is an Indian example of a small group of Chatterers peculiar to Southern Asia and Australasia. They have the wings very long and pointed, often extending even beyond the tail, whence they have received the name of Swallow-shrikes.

The habits of this bird somewhat resemble those of the Flycatchers, as it captures the greater part of its food, which consists of soft, winged insects, in the air; but it is sociable in its habits, several collecting in a small flock on the top of a palm-tree, or on a bare twig projecting from the upper part of some other tree, and flying off from time to time to make a short circuit in pursuit of insects, after which they all return and perch together as before. These flocks also frequently hawk about in the air like swallows, sometimes over water.

THE WOOD-SWALLOW (*Artamus sordidus*) is an inhabitant of the whole southern portion of the Australian continent, and also of the island of Van Diemen's Land, where however, it is decidedly migratory, arriving in October, at the commencement of the summer season. It measures about six inches in length, and presents a sufficient resemblance to a Swallow in its long wings and slightly forked tail, and also in many of its actions, to justify the colonists in selecting the name of Wood-swallow to distinguish it. The general colour of its plumage is a sooty gray, the wings are blue black, with the outer edges of the second, third, and fourth primaries white; the tail is also blue-black, with the tips of all the feathers, except the two middle ones, white. The power of flight possessed by this bird is very great, and its evolutions in the air are singularly graceful. It captures a portion of its insect prey while soaring aloft in the manner of a Swallow, but also seizes passing insects in the same way as the Flycatchers; or flies away from its perch, and sails round the tree, returning again to its original position. It is not a solitary bird, but three or four individuals may be seen sitting together on a twig side by side, and generally quite close to each other; they do not fly off in a party, but each bird as his desires prompt him, takes a short flight in pursuit of prey, and returns independently to his perch. They also perch in the same way upon a rail, and fly down one by one to pick up insects amongst the grass of the pastures. The most remarkable peculiarity in the habits of this bird is "its manner of suspending itself in perfect clusters, like a swarm of bees; a few birds suspending themselves in the under side of a dead branch, while others of the flock attach themselves one to the other, in such numbers that they have been observed nearly of the size of a bushel measure."—(*Gilbert*, quoted by Gould.) Several other species of the genus *Artamus* inhabit various parts of Australia.

THE INDIAN KING-CROW (*Dicrurus macrocercus*). This is a very abundant species in most parts of India, where it has received the name of King-crow, or King of the Crows, from the incessant hostility which it exhibits towards any corvine intruders on its place of abode. As soon as these make their appearance, the King-crow attacks them with great clamour, following them pertinaciously, and pouncing down upon them from time to time. The food of this bird consists of insects, and he may be seen looking out for these from a hedge or bush, or some similar slight elevation, or even from the backs of cattle and sheep when grazing in a field. On observing the stirring of an insect in the herbage below him, he instantly darts down, seizes his prey, and flies up with it to his perch, where he devours it at his leisure and then looks out for more. He also captures winged insects in the air, and, in company with other birds, is a constant attendant at the issuing of the winged termites from their nests, an occasion which furnishes a rich feast. The note of this bird is described as a sort of crow or chuckle. Its flight is undulating, and not very rapid, except when in pursuit of a crow, or some other enemy. Its nest is composed of grass, twigs, and roots, carelessly put together, and contains from three to five eggs, of a white colour, with pale brown or purplish spots.

The King-crow is ten inches in length, of which, however, about half is made up by the long forked tail. It is a slender and graceful bird of a black colour. Several nearly allied species inhabit India, and have much the same habits as the common King-crow. Other species occur in Africa, and one, the SPANGLED DRONGO (*Dicrurus bracteatus*), in the northern part of Australia.

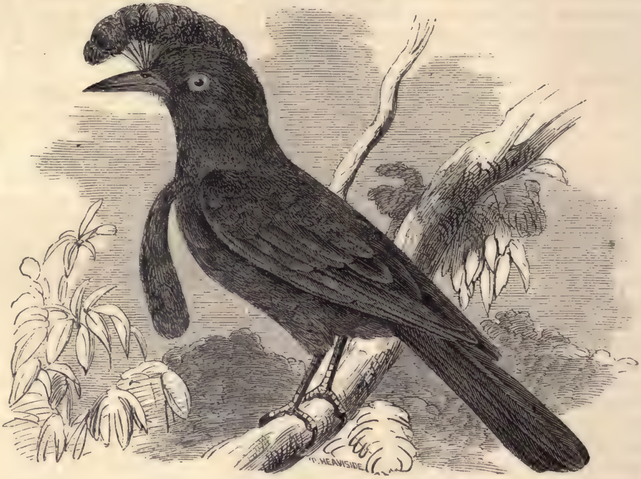
THE PARADISE DRONGO (*Edolius paradiseus*), another Indian species, is of a blue-black colour, with the head crested, and the two outer feathers of the tail much elongated, forming two long naked stalks, terminated by small palettes formed of barbs. This beautiful bird is abundant in the lofty jungles of Western India, where it is generally seen in small parties, and like the common King-crow, often pursues crows and birds of prey, and chases them from its haunts. Its food consists principally of large coleopterous insects, which it usually catches in the same way as the common King-crow; it also snaps up flying insects in the air, or snatches them from a branch. The note of this species is very peculiar, consisting of two parts, the first a sort of harsh chuckle, and the second a singular metallic sound, something like the creaking of a heavy wheel. It has other notes, and is said by the Hindoos to imitate the notes of all other birds; whence it has been called by them the *Huzar Dustan*, or "Bird of a Thousand Tales."

THE BARE-NECKED FRUIT-CROW (*Gymnoderus fœtidus.*) We conclude the family of the Chatterers with a singular series of American species, which exhibit so much analogy with the Crows, that by some ornithologists they have even been placed in that family of conirostral birds. The type of this small group is the Bare-necked Fruit-crow of Cayenne, a bird about the size of a pigeon, which does not appear to be very common in its native country, and the habits of which are almost unknown, except that it it said to feed principally upon fruits. This singular bird has a moderately long and stout bill, of a whitish colour, with the tip nearly black; the groove in which the nostrils are placed, is filled up and concealed by a thick covering of small velvet-like feathers, which, with the similar plumes of the head and upper part of the neck, are black. The skin of the neck is naked, with the exception of a few very minute black feathers, which are scattered here and there upon its surface; the plumage of the body is black, the wing-coverts and tertials bluish ash-colour, and the tail feathers black.

THE BALD-HEADED FRUIT-CROW (*Gymnocephalus calvus*), which is also an inhabitant of Cayenne, is about the size of a crow, and has the upper part of the head bare of feathers, from which the negroes of Cayenne have given it the name of the *Oiseau-mon-père*. The general colour of the plumage is olive, with a greenish tint on the upper, and a reddish tint on the lower surface; the wings are brown, and the tail blackish. Scarcely anything is known of the habits of this bird; it is supposed to live principally upon fruits.

THE UMBRELLA BIRD (*Cephalopterus ornatus*)—fig. 112—is perhaps one of the most extraordinary of birds, at least as regards the singular ornaments with which it is provided. It is about the size of a crow, and, as the whole of its plumage is of a deep black colour, it has a good deal of the corvine character in its aspect. But its head is adorned with a large and spreading crest, which appears as if intended by nature to serve as a parasol to keep the light from the eyes of the bird; it is at least as large in proportion as the articles commonly carried by ladies for that purpose. Mr. Wallace, who observed the bird in its native haunts, gives the following description of this singular ornament:—"The crest," he says, "is perhaps the most fully-developed and beautiful of any bird known. It is composed of long, slender feathers, rising from a contractile skin on the top of the head. The shafts are white, and the plume glossy blue, hair-like, and curved outwards at the tip. When the crest is laid back, the shafts form a compact white mass, sloping up from the top of the head, and surmounted by the dense hairy plumes. Even in this position it is not an inelegant crest; but it is when it is fully opened that its peculiar character is developed. The shafts then radiate on all sides from the top of the head, reaching in front beyond and below the tip of the beak, which is completely hid from view. The top then forms a perfect, slightly elongated dome of a beautiful shining blue colour, having a point of divergence rather behind the centre, like that in the human head. The length of this dome from front to back is about five inches, the breadth from four to four and a half inches." As if this remarkably beautiful crest was not sufficient to distinguish the bird amongst its fellows, it is also furnished with a second singular ornament, nothing resembling which is to be found in the whole series of birds. "This," to borrow Mr. Wallace's words again, "is a long cylindrical plume of feathers depending from the middle of the neck, and either carried close to the breast, or puffed out and hanging down in front. The feathers lap over each other, scale-like, and are bordered with fine metallic blue. On examining the structure of this plume, it is found not to be composed of feathers only growing from the neck, as seems to have been hitherto supposed. The skin of the neck is very loose; looser and larger, in fact, than any bird I know of. From the lower part grows a cylindrical fleshy process, about as thick as a goose-quill, and an inch and a half long. From this grow the feathers to the very point, thus producing the beautiful cylindrical plume quite detached from the breast, and forming an ornament as unique and elegant as the crest itself."

Fig. 112.



The Umbrella Bird (Cephalopterus ornatus).

The Umbrella-bird is found along the course of the Brazilian rivers, principally upon the islands, at least in the lower parts of the great streams. Its food is said to consist of fruits; the stones of stone-fruits being ejected by the mouth. Its note is very loud, for which reason the Indians of the region bordering the Rio Negro call it the Piper-bird.

THE ARAPUNGA (*Chasmarhynchus albus*), the last species of this family to which we shall refer is called the Bell-bird in Guiana, from the similarity of its notes to those of a muffled-bell. It measures about twelve inches in length, and is of a white colour; at the base of the bill is a cylindrical, fleshy wattle, clothed with minute white feathers, which is flaccid and pendent when the bird is quiet, but becomes inflated when he is under the influence of any emotion, and then attains a length of two inches or more, and a diameter of about a third of an inch at the base. This effect is said to be produced by the impulsion of air, which is afterwards confined in the cavity. The note of this bird and its allies is usually heard only during the height of summer, for which reason the name of *Ave de Verano*, or "Bird of Summer," has been given to one of the species; this is contracted into *Averano*. Waterton states that the note of the Bell-bird may be heard at a distance of three miles. The food of this bird consists of fruits and berries, occasionally varied with caterpillars and other soft insects. It lives in the forests, and is a solitary bird.

FAMILY V.—LANIIDÆ.

The dentirostral section of the passerine birds is concluded by the family Laniidæ, the ordinary species of which are commonly known as Shrikes. These birds have a tolerably long and stout bill, more or less compressed, hooked at the tip, and armed on each side of the upper mandible, near the tip, with a very distinct tooth or notch. The hinder part of the gape is furnished with about five strong bristles on each side, springing from the base of the upper mandible. The wings are moderately developed, with the first primary quill feather much shorter than the second. The feet are stout, with a long hind-toe, and all the toes are armed with long, curved, and acute claws.

The majority of the species of this family are inhabitants of the Eastern hemisphere, a few only being found in the New World. Their food consists, like that of the birds of the preceding families, of insects, worms, and mollusca; but many of them are not content with such small game, and kill and devour the smaller birds and quadrupeds. In fact, the hooked tip of the bill, the strong teeth with which the upper mandible is armed, and the curved and acute claws, seem at once to indicate that the character of these birds is more predaceous than that of their nearest allies, and by Linnæus, and several of the older naturalists, they were placed in the same order with the Raptores.

THE RED-BACKED SHRIKE (*Lanius collurio*) is the most abundant British species of this family; it is a summer visitor to this country, where it is most commonly seen in the southern counties, and does not appear to advance further to the north than Cumberland. It arrives here from its African winter-quarters about the end of April, and quits us again in September. This bird is found in most parts of Europe, as far north as Norway and Sweden; in Africa it has been met with in various places from Egypt to the Cape of Good Hope. The male is about seven inches and a half in length; the female a little larger. The male has the back of the head and neck gray, the chin and throat white, and a band running over the base of the bill, and through the eyes, black; the back and wing-coverts are chestnut-red, the upper tail-coverts gray, the wings black, with the margins of the feathers red, and the lower surface pale red. The two middle tail-feathers are black, the rest white at the base, and black at the extremity, the extreme tips of all being white. The female has the whole upper surface reddish-brown, with no black on the head, the tail brown, and the lower surface grayish-white, with numerous brownish transverse lines. The food of the Red-backed Shrike consists partly of insects, particularly the common cockchafer; and partly of small vertebrate animals, such as mice, shrews, and small birds. Of the latter it has been known to kill birds as large as finches, and has even been seen in pursuit of a blackbird. In common with many other species of this family, this bird has the singular habit of hanging up its prey, either by fixing it in the forked branch of a tree or shrub, or by impaling it upon a thorn, so as to pluck off the feathers of birds, and tear away their limbs with more facility. Even its insect prey is served in this way, cockchafers being often found impaled by it upon a thorn passing through the thorax, and with the abdomen torn away. From this curious habit the Shrikes are frequently called Butcher-birds.

The Red-backed Shrike makes a large nest of a cup-like form, composed of the coarse stalks of plants, moss, and roots, and lined with bents and hair. The nest is placed in a strong hedge or thick bush, and contains four or five eggs, which vary in colour, being either bluish, greenish, or reddish-white, and spotted with different shades of brown. The ordinary note of the male is a chirping noise, like that of a sparrow; but he is said sometimes to utter a sort of song.

THE GREAT CINEREOUS SHRIKE (*Lanius excubitor*) —Plate 11, fig. 37—is also met with in this country, but appears to be only an occasional visitor here; on the continent of Europe it is a well-known bird, and is abundant in France. It is a good deal larger than the preceding species, measuring about ten inches in length; the head is marked with black as in the Red-backed Shrike; the upper surface is pearly-gray, the lower surface pure white, and the wings and tail are black; the former with a white bar near the base of each feather, and the latter with each quill tipped with white, the amount of white increasing toward the sides of the tail. The female resembles the male, but is duller in colour.

In its habits this bird agrees with the preceding, and its food consists of mice, shrews, small birds, frogs, lizards, and insects. These it fixes upon a thorn or forked branch, before proceeding to devour them; and it is a popular notion that the bird captures nine birds or other animals, and suspends them in this way, before beginning to eat any of them. Hence is derived one of its common names—*Ninekiller*. It is a bold and combative bird, attacking crows and other birds much larger than itself, when they come into its haunts; and it has even been used instead of a falcon to fly at small birds. The foreign falconers often make a very different use of it, employing it in trapping hawks during the autumn and winter. The Shrike is fastened to the ground, and, on the approach of the hawk, begins screaming loudly, and thus gives the falconer notice of the fact; from this he is called *excubitor*, or the sentinel.

THE WOOD-CHAT (*Lanius rutilus*) is about the size of the Red-backed Shrike, but has the back of the head and neck rich chestnut-red, the back black, and the lower surface white. In its habits, it resembles the Red-backed Shrike, and like it is a summer visitor to Europe, in the southern parts of which it is not uncommon, but does not advance far towards the north, and is only an occasional visitor to this country. It builds its nest upon the forked branch of a tree, generally selecting an oak.

THE AMERICAN GRAY SHRIKE (*Lanius borealis*), a common species in the United States, resembles the Cinereous Shrike of Europe in size and general aspect, and indeed, was formerly regarded as identical with it. The principal differences consist in the presence of transverse dusky lines on the lower surface, and in the bluish colour of the bill, which has the tip alone black; the whole bill being black in the European species. In its habits, this bird agrees with its eastern congeners, feeding on small vertebrate animals and insects, which it impales upon thorns; amongst insects, grasshoppers are said to be its favourite food.

THE LOGGERHEAD SHRIKE (*Lanius ludovicianus*), another American species, is found only in the southern states of the American Union. It is common in the rice-fields of Carolina and Georgia, where it is regarded with favour, on account of its destroying mice, for which it will watch for hours, like a cat, beside the stacks of rice. It also devours crickets and grasshoppers.

THE CRESTED SHRIKE (*Lanius cristatus*). Numerous species of shrikes inhabit India and the neighbouring countries; and amongst these, the commonest is the Crested Shrike. It is about the size of our Red-backed Shrike; the head is crested, and has a black spot on the ears; the plumage is reddish-brown above, pale tawny beneath, with transverse brownish lines; the tail is reddish. This bird resembles the preceding species in habits, preying, like them, upon insects and small birds, and building its nest in thickets and bushes. It has a peculiarly harsh chattering note; which, according to Mr. Blyth, affords one of the earliest intimations of the advent of the cold season in Calcutta, when it is heard with a favour not due to its musical properties.

THE INDIAN GREY SHRIKE (*Tephrodornis pondiceriana*) is a common bird in Southern India, but also occurs in Nepal and other northern districts, being apparently a migratory species. It is a small bird, of a gray colour above and white beneath, with the sides of the tail white, and is generally seen in small flocks consisting of four or five pairs. Its food consists of insects, which it seeks upon the branches of the trees. When disturbed, it emits a sharp cry, but also possesses a fine mellow note; for the sake of which it is sometimes kept in confinement.

THE CAYENNE GREEN SHRIKE (*Cyclorhis guianensis*), an inhabitant of tropical South America, is about six inches in length, and of a green colour, with the head gray, and the forehead and a stripe on each side of the head red. In the thick forests, this bird haunts the upper branches of the trees, but is also met with upon the vast plains or *campos* of the interior of Brazil, and here dwells contentedly in low bushes. It is a solitary bird, but is active in its habits, constantly moving about amongst the branches in pursuit of the insects which constitute its food.

THE CRESTED SHRIKE-TIT (*Falcunculus frontatus*). Among the Australian species of this family, the species of the genus *Falcunculus* are remarkable as presenting a striking analogical relationship to the Tits. The present species, which is the most abundant and best known, is an inhabitant of New South Wales and South Australia, where it haunts both the thick brushes and the trees in the open plains. It is an active and sprightly bird, displaying great agility in pursuit of the insects which constitute its food, and which it captures on the branches and trunks of the trees, often stripping off the bark in search of beetles which feed beneath it. In this operation, the great strength of its beak is very serviceable; and so powerful is this organ that the bird is able to break up and devour even the large Cicadæ which abound in Australia.

The Crested Shrike-Tit is about six inches in length. Its head is adorned with a crest of black plumes, below which on each side is a broad streak of white passing over the eye; the forehead is white, and a second white streak passes beneath the eye, separated from that above by a broad black band; the chin and throat are black; the upper surface is olive-coloured, the quill feathers of the wings and tail are blackish-brown, margined with gray, and the whole lower surface is bright yellow. The bill is black, and the feet are bluish gray. The only note of this bird is a low piping. The nest, according to M. Verreaux, is firmly attached to the twigs of trees, and composed of small sticks and strips of bark.

THE WHITE BELLIED SHRIKE-TIT (*Falcunculus leucogaster*) is a native of Western Australia, where it represents the preceding species, presenting a close general resemblance to it both in appearance and habits. The principal differences consist in the colouring of various parts of the plumage, but especially in the whiteness of the abdomen and legs.

THE CRESTED BELL-BIRD (*Oreoïca gutturalis*), which is also an inhabitant of Australia, is about seven inches in length, and of a light brown colour, with the wings and tail darker; the male has the face and chin white, the breast marked with a large deep-black crescent of which the horns reach up nearly to the eye on each side, and the head adorned with a very full crest, which is deep-black in front and gray behind. The range of this bird extends over the whole southern portion of Australia, but it has not yet been found in Van Diemen's Land. In Swan River it is called the Bell-bird by the colonists; the true Bell-bird of New South Wales (*Myzantha melanophrys*) being wanting in that colony. It is found in the open parts of the forest, and passes a good deal of its time on the ground. Its note is described by Mr. Gould as a peculiar, mournful piping, and it is also a ventriloquist of great power, its note often sounding as if at a considerable distance, when in reality the bird is perched upon the branch of a neighbouring tree, and then gradually increasing in volume until it appears to be just over the head of the hearer. Its favourite food consists of grubs and caterpillars, in search of which it frequently resorts to newly-ploughed land. The nest of this species is usually placed in a grass tree, and is composed of strips of bark, and lined with dry grass. It lays three eggs, which are generally of a bluish-white colour, speckled or streaked and spotted with black.

THE PORT-JACKSON THRUSH (*Colluricincla harmonica*) an inhabitant of New South Wales and South Australia, measures about nine inches in length, and is of an olive-brown colour above, with the head and tail grayish, and the wings slaty black; the lower surface is light brownish-gray, becoming white at the vent. It haunts the brushes in all parts of the country in which it is found, and is an active bird, hopping about amongst the branches and feeding upon caterpillars, grubs, and other insects. Whilst engaged in the pursuit of its prey, the bird gives utterance to a number of powerful swelling notes, louder than those of the European Song-thrush, but less varied, and not so well combined into a song. The nest is placed in various situations, such as the hollow bole of a small tree, the decayed branch of a larger one, or on the ledge of a rock; it is cup-shaped, composed of strips of bark and leaves, and lined with root-fibres. The eggs, which are three in number, are pearly white, with a few larger blotches of light-brown and bluish-gray.

Several nearly allied species are found in different parts of Australia; thus the BUFF-BELLIED THRUSH (*C. rufiventris*) inhabits the Swan River colony, where it is known as the Thrush by the settlers; the BROWN THRUSH (*C. brunnea*) occurs at Port-Essington; and SELBY'S THRUSH (*C. Selbii*) in Van Diemen's Land.

THE SPOTTED BATARA (*Thamnophilus nœvius*).—Numerous species of Shrikes belonging to the genus *Thamnophilus* have been found in the tropical parts of South America; they differ from the ordinary Shrikes in the greater length and slenderness of the bill, which is also less strongly hooked at the tip. They have been called *Bataras*, from the name applied by the Guaranis to the species common in their country.

The Spotted Batara, one of the earliest known species, is rather more than six inches in length. It is black above, with white spots on the back and wing-coverts; the quill feathers are margined with white, and those of the tail have white tips; the lower surface is ash colour. This bird inhabits Cayenne and Brazil, dwelling amongst the bushes, usually in pairs, and exhibits much familiarity, often approaching the dwellings of man. The food of this and the other species consists of insects and their larvæ, which they generally capture upon the branches, rarely descending to the ground in search of prey, and then carrying it up into the bushes to devour it.

THE GONOLEK (*Laniarius barbarus*).—The Gonoleks of Le Vaillant form an exclusively African genus, which agrees with the preceding South American forms in the slenderness and straightness of the bill. The present species is about the size of the Red-backed Shrike; it is black above and reddish beneath, with the crown of the head, the vent, and thighs, tawny yellow. In its habits this species, like its congeners, resembles the *Thamnophili*, living concealed amongst the bushes, and feeding upon insects and their larvæ.

THE BLACK-THROATED CROW SHRIKE (*Cracticus nigrogularis*).—The Crow Shrikes or *Cractici* are peculiar to Australia and the islands of the Pacific, where they take the place of our common shrikes. The present species is found only in New South Wales, where it inhabits the rich districts known as apple-tree flats, and undulating countries with scattered large trees. It is usually seen in pairs, and haunts the lower branches of the trees, from which it not unfrequently descends to the ground in pursuit of its prey, consisting of insects, small lizards, and mice. It also kills and devours small birds. The nest of this species is rather large, and resembles that of the common jay of Europe; it is composed of sticks, lined with fine fibrous roots, and is generally placed on a horizontal branch, where it is concealed by the thick foliage. The eggs are yellowish-brown, with darker spots.

From its size and elegantly pied plumage, this bird is a conspicuous object upon the trees which it frequents. The total length of the male is rather more than twelve inches; he is a little larger than the female. In both sexes the head, neck, and chest are black; the back and wings are also black, the latter with the centre, the shoulder, and the basal part of the outer edge white; the lower part of the neck, the rump, and the whole lower surface is white; and the tail is black, with the tips of all the feathers, except the two middle ones, white. The feet are black, and the bill lead colour, with the tip black.

THE PIED CROW SHRIKE (*Cracticus picatus*) closely resembles the preceding in the distribution of its colours, but is a smaller bird, measuring only eleven inches in length. It is found at Port-Essington in considerable abundance.

THE AUSTRALIAN BUTCHER-BIRD (*Cracticus destructor*), another of the Crow-shrikes, is an inhabitant of New South Wales and South Australia, throughout which it is very generally distributed, haunting both the brushes and the belts of trees in the open country. It is seen sitting motionless upon the trees, watching all that goes on around it, but especially keeping a sharp eye upon the ground beneath, ready to pounce down in a moment upon any large insect or small lizard that may make its appearance there; it also feeds upon small birds and mice, and is observed to impale or suspend its victims in the same way as the common Shrikes of Europe. In its habits it is usually a shy and retiring bird, but constantly reveals its presence in the neighbourhood by its curious note, which, Mr. Gould tells us, is "a jumble of discordant sounds impossible to be described." The nest resembles that of the preceding species.

The length of this Butcher-bird is about eleven inches. The head and back of the neck are black; the upper surface is dark grayish-brown, becoming blackish on the wings and tail; the middle secondaries have their outer margins white, forming a white streak when the wing is closed; the tail feathers, except the two middle ones, are tipped with white on their inner webs; the plumage of the lower surface is grayish-white, and an irregular band of white passes up nearly to the nape of the neck; the bill is lead colour with the tip black, and the feet are blackish.

QUOY'S CROW SHRIKE (*Cracticus Quoyii*), a large and handsome species of this genus, occurs both in New Guinea and on the opposite northern coast of Australia. It measures nearly fifteen inches in length, including the long bill, which is about two inches. The whole of the plumage is glossy black, with the edges of all the feathers shining green; the bill is usually gray, with the tip black, and the feet are black. This fine bird is very shy and wary in its disposition, inhabiting the thickest and darkest parts of the mangrove swamps, searching for crabs, which constitute a great portion of its food, upon the deep mud amongst the roots of the trees. It also feeds occasionally upon insects.

With the Crow Shrikes we close the series of Dentirostral birds. The next division, that of the Conirostres, commences with the great family of the Crows, in which we include some Australian species presenting a considerable resemblance to the Crow Shrikes; so close, indeed, is the analogy existing between them, that by some ornithologists, they are considered as forming a single group.

TRIBE IV.—CONIROSTRES.

In the birds of this group—which may be regarded as including the types of the Passeres, and perhaps also the types of the class of birds in general—the bill is usually of a distinctly conical form, although it varies a good deal in length and thickness, and is sometimes more or less curved. The tip of the upper mandible is generally straight, and its margin unarmed; but in some of the forms most nearly allied to the preceding section, the edges of the upper mandible are notched near the extremity, and the tip itself is slightly hooked.

The food of the majority of the species of this group, especially those with straight and stout conical bills, consists principally of seeds, for breaking which this form of bill is peculiarly adapted. There are, however, few, if any of these birds, which do not live partially upon animal food, such as insects and their larvæ, whilst some appear to devour almost anything that comes in their way, and is fitted to afford them nourishment.

FAMILY I.—CORVIDÆ.

This family includes the numerous species of crows and other allied forms, many of which are amongst the most omnivorous of birds; in fact, the Corvidæ constitute the principal portion of the order which M. Temminck proposed to establish under the name of *Omnivores*. They have a more or less elongated, strong, and compressed conical bill, in which the ridge of the upper mandible is curved, and its tip slightly notched on each side. The nostrils are placed at the base of the upper mandible, and concealed beneath a group of small feathers which grow there. The wings are generally long and powerful, and the feet of moderate length, and strong.

These birds seem to be almost equally adapted for a terrestrial and an aërial existence; they walk and run upon the ground with great facility, rise easily from the ground, fly well, and display considerable activity amongst the branches of trees. They are very generally distributed over the face of the globe, and everywhere readily find the means of living; for most of them are by no means particular about their diet, feeding indifferently upon grain, fruit, insects, and carrion, or even attacking and devouring small birds, and such weakly animals as they can easily overcome. They are for the most part noisy birds, with much slyness and drollery in their disposition, and many of them, especially when tamed, exhibit a strong inclination for thievery and mischief.

THE PIPING CROW (*Gymnorhina tibicen*). We commence this family with the Piping Crow of Australia, because this bird, with its immediate allies, is evidently nearly related to the crow shrikes, with which we concluded the preceding section; in fact, by many authors these birds have been placed together in a single group, sometimes on one side, sometimes on the other of the line of demarcation between the crows and the shrikes.

The Piping Crow is a large species, measuring about sixteen inches in length. The greater part of the plumage is deep black, but the nape of the neck, the wing-coverts, the rump, vent, and upper and lower tail-coverts are white; the tail feathers are also white, largely tipped with black. The bill is bluish-ash colour at the base, and black at the tip, and the feet are black. The nostrils in this and the allied species are not concealed as in the ordinary crows, but form elongated slits in the sides of the upper mandible.

This handsome bird is an inhabitant of New South Wales, over which it is very generally diffused, haunting the trees in the vicinity of cleared lands and plains, and, when not disturbed in any way, approaching the habitations of the settlers with the greatest boldness and familiarity. It lives almost entirely upon insects, which it generally captures on the ground; and Mr. Gould states that it devours immense numbers of locusts and grasshoppers. In captivity it feeds upon animal food of almost any kind, and displays many of the amusing qualities of the ordinary crows; but it has one advantage over the latter in the beauty of its note, which is a rich and mellow pipe, capable of considerable modulation. In fact, this bird will learn to whistle tunes with great accuracy. The Piping Crow builds a large, round, cup-shaped nest among the branches of a tree, constructing it of sticks, leaves, and wool, and lining it with finer materials. It begins to breed in August, and rears two broods in the season, which lasts till January.

THE WHITE-BACKED PIPING CROW (*Gymnorhina leuconota*) is about the same size as the preceding species, which it closely resembles in its appearance, but may be at once distinguished by its pure white back. It is an inhabitant of South Australia, where it exactly represents the Piping Crow of New South Wales, but is a shy and wary, instead of a bold and familiar bird.

THE TASMANIAN PIPING CROW (*Gymnorhina organica*), a smaller species than either of the preceding, measuring only thirteen inches in length, resembles the White-backed Crow in its white back, but has the whole lower surface black. It is found only in Van Diemen's Land, where it resides amongst the trees in the open parts of the country. In its habits it resembles the New South Wales species, feeding upon insects, which it procures on the ground. In the early morning this bird perches upon the dead branch of a gum-tree, and "pours forth a succession of notes of the strangest description that can be imagined, much resembling," says Mr. Gould, "the sounds of a hand-organ out of tune, which has obtained for it the colonial name of the *Organ-bird*." In captivity it readily learns to whistle tunes or to articulate words, so that it becomes a most amusing pet.

THE PIED FRUIT CROW (*Strepera graculina*) is an abundant and generally distributed bird in the colony of New South Wales, inhabiting alike the brushes of the coast, the sides of the mountains, and the forests of *Eucalypti* of the intermediate plains. It is a large and handsome bird, measuring nearly eighteen inches in length; the whole of the plumage is jetty black, with the exception of a large patch on each wing, the under tail-coverts, and the bases and tips of the tail feathers, which are pure white. The food of this bird consists principally of fruits, berries, and seeds, of which it finds an abundance among the branches of the trees, so that it descends less frequently to the ground than the preceding species, to which, in other respects, it is nearly allied. Its flesh is frequently eaten, and by some people regarded as a delicacy.

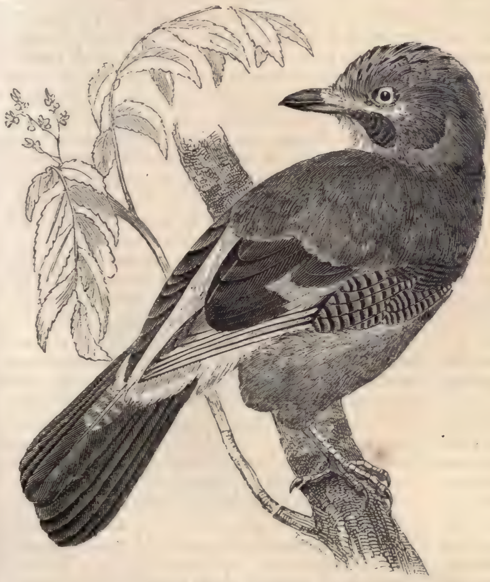
THE HILL FRUIT CROW (*Strepera arguta*), an abundant species in Van Diemen's Land, and also met with, but rarely, in Southern Australia, is larger than any of the preceding, measuring about two feet in length. It is of a sooty-brown colour, with a patch on the wing the under tail-coverts and the tips of the inner webs of the tail feathers white. According to Mr. Gould, the food of this bird consists principally of insects, and its note is loud and ringing, resembling the distant sound of the strokes on a blacksmith's anvil.

THE SOOTY FRUIT CROW (*S. fuliginosa*), a smaller species, which is also common in Van Diemen's Land, is known to the colonists as the Black Magpie.

THE JAY (*Garrulus glandarius*).—This handsome bird, which is abundant in the wooded districts of Europe, measures nearly fourteen inches in length, and is of a general reddish-brown colour, paler beneath; the crown of the head is adorned with a small erectile crest, of which each feather is streaked with black; on each side of the chin is a moustache-like black streak; the quill feathers of the wings are black, with the outer webs of the primaries dusky-white, and a pure white spot near the base of the secondaries; the primary wing-coverts are barred with black, white, and bright blue; and the tail feathers are black.—Fig. 113.

The Jay is well known in England and the southern parts of Scotland, inhabiting the thick woods, and building its nest either in a tall bush or amongst the lower branches of a tree, but always in a situation which affords it a safe concealment. The nest is cup-shaped, and composed externally of small sticks and twigs, lined with roots and grasses. The eggs, which are five or six in number, are of a yellowish-brown colour, minutely speckled with light brown. The young birds are said to accompany their parents for several months.

Fig. 113.



The Jay (Garrulus glandarius).

The food of the Jay consists partly of insects and worms, and partly of vegetable matters, especially acorns and beech mast, its predilection for which is alluded to in its specific name. Occasionally, during the summer, this bird lays aside a certain portion of its natural shyness, and ventures into the gardens to feast upon peas and ripe cherries, a habit which causes the gardener to regard him as an enemy, and destroy him with as little compassion as the gamekeeper, who considers him as a destroyer of eggs and young birds. The general note of the Jay is harsh and grating, but Montagu says that in the spring he will utter a soft and pleasing song, and in captivity there is scarcely any sound that he will not learn to imitate; the cries of fowls, the bleating of a lamb, the mewing of a cat, the barking of a dog, the neighing of a horse, and even the articulate sounds of the human voice are reproduced by him with the greatest exactness. Bewick mentions his having heard one imitate the sound of a saw so exactly, that though it was on a Sunday, people could hardly be persuaded that there was not a carpenter at work in the house.

THE BLUE JAY (*Cyanurus cristatus*).—This bird, which is an inhabitant of most parts of North America, is more elegant in its form than the preceding species, which it resembles in its general habits, and in its liveliness and imitative talents. Its plumage is light purplish blue above, and white beneath; the head is adorned with a handsome crest of blue feathers, and the neck with a crescent-shaped black mark; the wings are blue, as are also the feathers of the long wedge-shaped tail; the wing-primaries, and tail feathers being elegantly marked with transverse black bands, and tipped with white. The whole length of the bird is about eleven inches. The Blue Jay is an inhabitant of the woods and forests, amongst which his singular and varied notes are constantly heard during the spring season. His favourite diet consists of chestnuts, acorns, and Indian corn; but he also visits the gardens occasionally in search of fruit, and frequently picks up insects or caterpillars upon the branches of the trees. Sometimes he indulges his taste for animal food in a less innocent fashion, plundering the nests of his fellow-inhabitants of the woods, destroying their eggs, and tearing in pieces and devouring their helpless young. At the same time he exhibits a hypocritical enmity to the smaller hawks and owls, especially the latter, leading on the small birds to attack these enemies of their race with the greatest spirit and perseverance. The nest of this bird is placed in a tree, composed of twigs, and lined with dry root fibres. The eggs are five in number and of a dull olive colour, spotted with brown.

THE RAVEN (*Corvus corax*).—Of the British species of this family, the Raven is the largest and most powerful, the adult male measuring about twenty inches in length. It has a long and strong bill of a black colour, and the feathers springing from the base of the upper mandible and covering the nostrils are about an inch and a half long. The whole of the plumage is black, with a purple or bluish gloss; the irides are brown and grey, and the feet black. This bird is found in all parts of the northern hemisphere, extending its range even into the frozen regions of the Arctic zone, the severe winters of which it is able to survive. It is usually an inhabitant of the wildest and most secluded districts, haunting the rocks of the sea-coast or the sides of mountains, or the forests occupying extensive plains, and from its vigilance and sagacity its destruction is by no means an easy matter.

In the choice of his food the Raven is not at all particular, but feeds indiscriminately upon everything capable of supplying him with nourishment; he preys upon the smaller mammalia, birds, and reptiles, plunders birds' nests, and devours any carrion that falls in his way, diversifying this sufficiently varied diet by picking up insects, grain, and fruits. On the coast the dead fish and other animal matters constantly washed up by the waves, furnish him with abundant nutriment. His boldness also prompts to attack even the sickly and young individuals of large mammalia, and the sheep in mountainous districts are constantly exposed to his assaults. Whenever he observes an opportunity of securing a supply of food by this means, he commences by attacking the eye of his victim, and then proceeds to regale himself upon the flesh. When his appetite is satisfied, he retires to allow his food to digest, but soon returns for more. The remarkable instinct which leads the Raven and several of the other large crows to any spot where a supply of carrion is to be obtained, has often excited the wonder of naturalists; especially as they frequently come together in considerable numbers at a spot where none were to be seen but a short time before. As in the case of the vultures, the means by which they are enabled to detect the existence of their distant food has long been a matter of dispute among naturalists; some thinking that they discover their repast by the sense of smell, and others by that of sight. The most probable supposition seems to be that put forward by Mr. M'Gillivray, namely, that those which come from a distance are induced to undertake their journey by observing the movements of others within sight of the feast.

The voice of the Raven is a hoarse croak, and this, coupled with his intense black colour and the sagacity of his appearance, has no doubt had much to do with the evil reputation conferred upon this bird by the inhabitants of most countries. Almost everywhere indeed the Raven is regarded as a bird of ill omen, sharing with the owls in the superstitious horror of the ignorant. By the ancient Icelanders this bird was dedicated to Odin, and that deity was said to possess two ravens which were let loose every morning to ascertain what was going forward in the world, and returned at night to perch on Odin's shoulders, and whisper their intelligence into his ears. Even in the present day the Icelanders believe that the Raven is acquainted not only with what is going on at a distance, but also with what is to happen in the future. The superstitious notions of other nations with regard to the Raven seem all to partake more or less of the Icelandic cast. Nevertheless, in the present day at any rate, the Raven is not unfrequently kept in confinement, when his sagacity, and love of fun and mischief, render him amusing. Of all British birds he is perhaps the one which manifests the greatest power of imitating the human voice, and this is the more striking as his own natural note is one of the least attractive in nature. He is also sometimes friendly with other domesticated animals, and has been known to attend upon a wounded dog with great kindness, bringing him bones, and using every endeavour to console the sufferer under his affliction. Strange dogs, however, are generally regarded by him as enemies, and he is fond of giving them a sly nip with his powerful bill; one of the favourite amusements with tame Ravens being to conceal themselves until a dog passes by, when they rush out and endeavour to pinch his tail.

The nest of the Raven is built on a forked branch, composed of sticks, and lined with wool and hair; the bird generally selects a very high tree for the reception of its nest, and places it among the most inaccessible branches. The same nest serves, with a little repair, for several successive seasons, and it is remarkable that the same trees are so constantly resorted to by these birds that many trees have been known as "Raven-trees" from time immemorial.

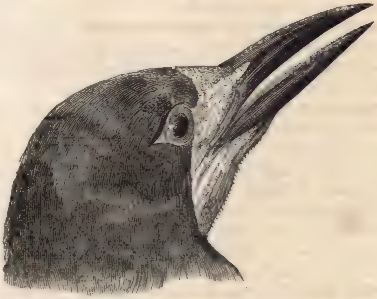
THE CARRION CROW (*Corvus Corone*), like the Raven, enjoys a very wide geographical range, being found in all the northern parts of the eastern hemisphere; it does not, however, occur in North America, where its place is taken by a closely allied species. The Crow measures rather more than eighteen inches in length, and is of a black colour, glossed with violet and green in certain lights; the feathers covering the nostrils are shorter than in the Raven, and the irides are brown. In its general habits it resembles the Raven, dwelling and breeding in wooded countries, and feeding both upon carrion and upon small animals, which it captures and tears to pieces like a raptorial bird. To sickly sheep and lambs it is, like the Raven, a dangerous enemy. Its note is a hoarse croak. The Carrion Crow is not so frequently domesticated as the Raven, but when kept in captivity it displays a considerable amount of sagacity. Mr. M'Gillivray mentions an example of the accurate memory of one of these birds which had buried a dead mole in his owner's garden, covering it over so cleverly that, although he had been watched through the whole operation, the place of burial of the mole could not be discovered. He was excluded from the garden for nearly a week; but on getting in he went directly to the spot where the mole was buried, and brought it out immmediately.

THE AUSTRALIAN CROW (*Corvus coronoïdes*), the only known species of true Crow inhabiting Australia, is very nearly allied both to the Raven and the Carrion Crow, between which Mr. Gould regards it as intermediate. It measures about twenty inches in length, and is of a shining purplish black, with a greenish gloss on the throat. The iris is white. This bird is met with in every part of Australia and in Van Diemen's Land; in its general habits and voice it resembles the European Carrion Crow.

THE HOODED CROW (*Corvus Cornix*), a third British species of the genus Corvus, appears to have nearly the same geographical distribution as the Carrion Crow, but is to a certain extent a migratory bird, breeding in the most northern countries of the eastern hemisphere, and only visiting the southern districts in the winter. Thus, even in Britain, the Hooded Crow is well known in the extreme northern parts of Scotland, and in the Orkney and Shetland Islands, where it breeds, but is rarely seen in England except during winter. It is abundant about Royston from October to March, and hence is frequently called the Royston Crow. The adult male is about twenty inches in length, the female rather less. The bill and feet are shining black; the whole of the head, the front of the neck, the wings and tail, are blue-black; and the remainder of the plumage gray, tinged with brown in the female. The general habits of this bird resemble those of the Carrion Crow, and like that species and the Raven it is charged with destroying young lambs and poultry. When these birds take up their abode on the coast, they feed upon marine animals, including shell-fish, such as cockles and mussels, and in order to obtain the latter, they will fly up with them into the air and drop them upon a rock. The nest of this species is built either in a tree or upon a ledge of rock; it is formed of sticks and straws, and lined with wool and hair, and serves for several successive seasons. One remarkable circumstance in the history of this bird is that it has been known repeatedly to pair and breed with the Carrion Crow, the Hooded Crow being usually the female.

THE ROOK (*Corvus frugilegus*) another well-known British species, is distinguished from the preceding members of its genus by its gregarious and sociable habits, which indicate, as Pennant says, that it is the *Corvus* of Virgil, and it is known as the Crow in many parts of this country. Rooks live constantly in flocks at all seasons of the year, and, as Mr. Yarrell remarks, further evince "the sociability of their dispositions, by appearing to prefer situations in the immediate vicinity of the abodes of man. There are not wanting instances," he adds, "where long-established rookeries near a mansion have been deserted by these birds, when it has happened that the house has been pulled down, or even abandoned as a habitation." In fact, so constantly is the Rook a companion of man, that we can hardly see these birds busy about their nests, or returning to their trees to roost in the evening, or hear their not over-melodious voices, without associating these sights and sounds with a human dwelling-place. They are not disturbed even by the bustle of great cities, and one or two pairs have frequently built their nests in a single elm tree at the corner of Wood Street and Cheapside, notwithstanding the constant roar of the traffic in the latter great thoroughfare. They have been known to exhibit great sagacity in selecting the trees on which to build their nests, avoiding those which were so decayed as to be in danger of coming down; and an instance is recorded of their forsaking those trees from which a portion of bark had been removed as an indication that they were to be felled. The nests, of which seven or eight are often seen on the same tree, are composed of twigs, and lined with grass and roots, and during the process of building, constant squabbles arise among the architects, caused by their endeavouring to plunder each other's materials at every opportunity. The same nest serves for several years.

Fig. 114.



Head of the Rook (Corvus frugilegus).

The food of the Rooks consists principally of worms, snails, slugs, and the grubs of insects, in search of which they frequent meadows, pastures, and ploughed fields. They have frequently been regarded as enemies by the farmer, but in this he is certainly in error; they may, indeed, occasionally consume some small portion of his produce, but the quantity of noxious insects destroyed by them is so enormous, that the benefits conferred by them upon the husbandman far exceed any damage they may do him. One of the commonest charges against the Rooks is, that they injure the pastures, by plucking up the grass and other meadow plants, apparently for the sake of mischief; but the fact is, that on investigation the plants pulled up are found to have been previously destroyed by the grubs of insects devouring their roots, and it is in order to obtain these that the Rooks render themselves liable to a charge of doing mischief which was in reality ready done to their beaks. In searching after the earth-loving insects which constitute their principal food, the Rooks dig into the ground with their beaks, and in consequence of this the feathers at the base of the bill and on the throat, which are present in young birds, become gradually rubbed off and destroyed, leaving a rough naked skin on these parts. The bill is sometimes liable to curious malformations, specimens having been shot with the mandibles crossed, or with one mandible produced to a great length beyond the other, rendering it difficult to understand how the birds could continne to pick up their living. In captivity the Rook is said to exhibit the same amusing qualities as his congeners, except that his powers of imitation seem to be more limited.

THE JACKDAW (*Corvus monedula*), a smaller species than any of the preceding, resembles the Rook in living together sociably in considerable flocks throughout the year. It is a common inhabitant of Britain, and also of the continent of Europe, extending southward to the northern shores of Africa, and eastward at least as far as Lake Baikal in Central Asia. The Jackdaw is a bold and familiar bird, generally inhabiting cultivated and well-peopled districts, and frequenting especially the towers and belfries of churches and similar elevated buildings, amongst the nooks and crannies of which it builds its nest and brings up its young. In more rural districts and on the coast the Jackdaw builds in the cavities of rocks, cliffs, and quarries, and also in chimneys, which are sometimes quite stopped by the quantity of materials brought in to form the nest. It has also been known to breed in a hollow tree. The nest is composed of a great mass of sticks lined with wool and other soft substances, and the quantity of materials brought together is sometimes enormous. A curious illustration of this was furnished in Cambridge, in the neighbourhood of the botanic garden, from which the numerous Jackdaws residing in its vicinity, took it into their heads to carry off the labels stuck into the ground beside patches of newly-sown seeds, to the great disgust of the gardeners. These labels were pieces of deal laths, about nine inches long and one inch broad, and no fewer than eighteen dozen of these sticks were taken out of a single chimney in the neighbourhood, occupied by Jackdaws as a breeding place. In another case, a pair of Jackdaws built their nest on a winding staircase in a church in Lincolnshire; and, finding that the steps were too narrow to furnish a secure resting-place, they actually piled up a mass of sticks, occupying five or six steps.

The Jackdaw is of a black colour above, but not so deep and shining as the preceding species, and he has the back and sides of the neck of a sooty-gray colour; the lower surface is rusty black. The bill and feet are black, and the irides white. His length is about fourteen inches. Like the larger crows, he is by no means particular in his diet, feeding indiscriminately on grain, fruit, insects, or carrion; and, when he inhabits the coast, on shell-fish, crustacea, and dead animal matters thrown up by the waves. He does not, however, appear to be predatory in his habits, although he is occasionally to be seen on the backs of sheep, either plucking out wool to line his nest or searching for the parasitic insects which infest those animals; this habit is commemorated in one of the fables of Æsop, although the object of the bird was misunderstood by the Grecian sage, and consequently the moral derived from it will hardly hold good. Young Jackdaws taken from the nest are easily tamed, when they become very amusing, and may even be taught to speak.

THE INDIAN HOODED CROW (*Corvus splendens*) resembles our Hooded Crow in its general appearance, but is a far more handsome bird. It has the top of the head and the face black; the nape, neck, back, and breast ash coloured; the wings shining violet blue; the belly slate colour; and the rump and tail black, with a violet blue gloss. This, which is the common crow of India, is a bold, familiar, and impudent bird, coming freely into the towns and villages, and seeking for its food in the streets, without allowing itself to be disturbed by the bustle of the passengers. It will even come into the houses and carry off anything that lies in its way. It is, however, exceedingly cunning, and seems to know by intuition when any one has a design against it, so that it is a most difficult matter either to shoot or capture a specimen. Its sagacity is well illustrated by the following anecdote related by Lieutenant Burgess:—"Some crows," he says, "had been sitting near a young dog, watching him whilst engaged with a bone. Having apparently concerted the plan, one of them alighted, stepped up, and took a peck at the dog's tail; the dog, irritated, made a snap at the bully; on which a comrade, who appears to have been ready, made a dash and went off with the prize." These birds seem to agree very well among themselves, however, and even to manifest a certain amount of kindness to each other. Mr. Blyth mentions his having seen two nearly blind crows, amongst a party of about twenty, which were fed by their companions like nestlings.

THE INDIAN CARRION CROW (*Corvus culminatus*) closely resembles our Carrion Crow in appearance and habits, and seems to take the place of that species in India. It is found in the forests and wooded districts, and is a predatory bird, attacking young poultry and pigeons, and hastening the death of wounded or sickly animals of larger dimensions, making its first assault upon their eyes in the same way as the Raven and Carrion Crow of Europe.

THE CAFFRARIAN CROW-VULTURE (*Corvultur albicollis*).—Two African species of this family are remarkable on account of the form of the bill, which is large, much compressed, its height being twice its width, and much curved along the ridge of the upper mandible. Both these birds are black, with a large white spot on the back of the neck; in the present species this spot is semilunar, and the wing-coverts are brownish. It is an inhabitant of Caffraria, and is a bold, noisy bird of about twenty inches in length; its food consists principally of carrion, but it also kills lambs and young antelopes, and even attacks large quadrupeds, such as oxen, buffaloes, and even elephants, when their skins present any wounds or ulcers. In this, however, the Crow is often doing his apparent victims a service, by ridding him of insect parasites.

THE ABYSSINIAN CROW-VULTURE (*Corvultur crassirostris*) resembles the preceding in its habits; it is especially abundant about the slaughter-houses, where it feeds upon the blood and offals thrown out.

THE BALD HEADED CROW (*Picathartes gymnocephalus*) presents a remarkable resemblance to the vultures in having the head quite bare of feathers, and the neck clothed with short feathers. It is of a brown colour, with the back blackish, the neck white, and the bare head reddish; the bill is black, and the feet yellow. The whole length of this singular bird, which inhabits the west coast of Africa, is about sixteen inches; its habits are unknown.

THE MAGPIE (*Pica caudata*)—Plate 11, fig. 38.—This handsome bird, which is abundant in many parts of Britain, is distributed throughout the northern parts of both hemispheres. As it generally frequents inhabited districts in this country, and is very commonly kept in confinement, its elegantly pied plumage, and lively, cunning aspect, must be so familiar to every one as to render a description unnecessary. As food scarcely anything comes amiss to the Magpie; in its general habits it is strongly predaceous, destroying young poultry, game, and other small animals, and even occasionally attacking young lambs and sickly sheep in the same way as the larger crows, whilst, when these delicacies cannot be got, it will take up with carrion, worms, and insects, and even with fruit and grain. Hence, its fondness for the vicinity of human habitations is by no means reciprocated by the occupants of the latter; and, in this country, at all events, it is subject to so determined a persecution, that, as Mr. Yarrell observes, "but for its sagacity, eminently evinced in its self-preservation, it would be a rare bird."

The Magpie usually dwells in woods and plantations, where it builds its nest in a high tree, but sometimes frequents tall hedges, and builds in a thick bush. The nest, which serves for several seasons, is a domed structure, with an aperture on one side. It is composed of thorny sticks, strongly interlaced, plastered with mud on the inside, and lined with grass and root fibres. The eggs, which are laid early in the spring, are six or seven in number, and of a pale bluish-white colour, with numerous spots of ash colour and brown. If taken young, the Magpie is easily tamed, when, like the other species of this family, he becomes very amusing, and exhibits great power of imitating sounds of all kinds. He is, however, the most thievish of all the crows, possessing a stealing monomania so strong that he cannot resist the temptation of picking up and concealing any bright object that may fall in his way, although, of course, his hoards of this nature cannot be of the slightest use to him.

THE NUTCRACKER (*Nucifraga caryocatactes*), a rare occasional visitor to Britain, is not uncommon in some parts of the continent of Europe, and is said to be abundant in the pine forests of Russia and Siberia. It measures about fourteen inches in length, and is of a clove-brown colour both above and beneath, the plumage being marked with triangular whitish spots on the extremity of each feather. The crown of the head is dark brown, without any spots, the wings are blackish-brown, as are also the tail feathers; but the whole of the latter, except the two middle ones, have a white tip, which gradually increases in extent towards the sides. The food of this bird consists of insects, seeds, and nuts; the latter it is said to crack in the same way as the Nuthatch, by fixing them in the crevice of the bark of a tree, and hammering at them with its powerful beak.

The Nutcracker exhibits some resemblance to the woodpeckers in its habits. It climbs, or rather runs upon the bark of trees, supporting itself by means of its tail, of which the feathers are thus usually more or less worn, and it nidificates in the holes of trees, which it enlarges to suit its purpose by means of its bill. The eggs are five or six in number, and of a yellowish-gray colour, with a few light brown spots.

THE ALPINE CHOUGH (*Pyrrhocorax alpinus*), a native of the mountainous countries of southern Europe and Asia, is of a black colour, with a greenish gloss, which is most brilliant on the upper surface; the bill is orange-yellow, and the feet vermilion. The whole length of the bird is about sixteen inches. Its food consists of seeds, berries, worms, and insects, but in times of scarcity it is known to content itself with carrion. Its nest is built in the clefts and caverns of the rocks, and it lays four or five white eggs, spotted with dull yellow.

THE CORNISH CHOUGH (*Fregilus graculus*), a species nearly allied to the preceding, is generally distributed in the rocky and mountainous temperate parts of the eastern hemisphere; in this country it is a rather rare bird, and is generally met with about the cliffs of our southern coast. Its name of Cornish Chough is given to it from its being better known in Cornwall than elsewhere in our island. The plumage of this bird is black, with a bluish gloss; the irides exhibit two rings, of which the inner is red, the outer blue, and the eyes are surrounded by red eyelids; the bill and feet are vermilion, and the claws black. From the bright red colour of the feet, the bird is frequently known as the RED-LEGGED CROW.

The food of the Chough consists of berries, grain, and insects, and he has been seen following the plough like a rook, to pick up the grubs from the broken ground. In confinement grasshoppers and fernchafers have been found to be favourite articles of food with him, but the cockchafer appears to be too large to be swallowed whole; he places it under one foot, pulls it to pieces, and thus devours it. The nest is composed of sticks, and lined with wool and hair; it is built in a cavity of some high cliff, or of some lofty ruined castle or tower, and contains four or five eggs of a yellowish-white colour, spotted with gray and light brown.

THE WHITE-WINGED CHOUGH (*Corcorax leucopterus*) is generally distributed over the whole of New South Wales and South Australia, evincing a preference for the open parts of the forests, except during the breeding season, when it haunts the borders of brooks and lagoons. It is of a black colour, with a greenish gloss, with the exception of the wing pinions, which have the greater part of their inner webs white. The iris is scarlet, and the bill and feet black. The nest is composed of mud and straw, in the form of a cup or basin, and placed upon the branch of a tree, usually overhanging the water. It contains from four to seven eggs, and Mr. Gould thinks that several females may sometimes deposit their eggs in the same nest, as four or five of them may be seen on the trees close to one engaged in sitting.

FAMILY II.—PARADISEIDÆ.

The small family to which the Birds of Paradise belong is evidently intermediate between that of the Crows, of which we have just described some of the more striking examples, and that of the Starlings to which we shall next have to refer. These birds appear, however, to be most nearly allied to the Crows, with which they have been arranged by some ornithologists. By others they have been placed with the *Epimachi*, amongst the tenuirostral birds.

The general characters of the Birds of Paradise are briefly as follows:—In the form of the bill, the position of the nostrils, and the presence of a tuft of plumes concealing the latter, they resemble the crows; the sides of the upper mandible are notched towards the tip; the wings are long and rounded at the tip; the tarsi are long and strong, and covered in front by a single long plate, followed by two or three smaller shields, or by three or four large plates of nearly equal size; the toes are well developed and terminated by long, curved claws, the posterior toe being very long, and the inner anterior one shorter than the outer. But the most remarkable character of the birds of this family consists in the great development in the males of some portions of the plumage, usually the feathers of the sides of the body and neck, which often present the most singular forms and give the birds a very peculiar appearance. In most cases they are adorned with brilliant and delicate colours, and some of them constitute well-known and elegant ornaments of ladies' dress.

The Birds of Paradise are confined to a very limited portion of the earth's surface, namely, New Guinea and the neighbouring islands. Amongst the luxuriant forests of these regions they live together in large troops, and their appearance when flitting about under the deep shadow of the trees must be most beautiful. They are polygamous, like the gallinaceous birds, which they resemble in the magnificence of the attire of the male. Their food consists principally of fruits.

THE EMERALD BIRD OF PARADISE (*Paradisea apoda*)—Plate 12, fig. 39—is one of the species so commonly imported into Europe for the adornment of ladies' bonnets and other head-dresses. It is an inhabitant of New Guinea and the islands lying to the west of that singular country, migrating from the one to the other with the monsoons. The general appearance of this bird is well known, and as it is represented in our figure, we need only state that the beautiful yellow plumes, which render it so elegant an ornament, spring from the sides of the body beneath the wings, and are of the structure commonly known as *decomposed*, that is to say, the barbs of the feathers are distinct from each other, and do not adhere by means of barbules as in ordinary feathers. The two centre feathers of the tail are elongated into long filaments, with very short barbs; these filaments and the yellow plumes are wanting in the female.

The inhabitants of the districts frequented by these birds kill them in great numbers, by climbing up into the trees at night, and shooting them with short arrows on their roosting places. The legs of the birds are then cut off, and their bodies dried by a fire, in which state they are sold to Malay dealers, by whose intervention they reach the hands of civilized merchants. For many years no specimens of the Emerald Bird of Paradise reached Europe except in this way, and thus it became a general opinion that this bird was naturally destitute of feet; so that, being incapable of perching, it was compelled to pass its whole life on the wing, and Linnæus, although aware that this notion was erroneous, gave the species the name of *Paradisea apoda*, or the *footless* bird of paradise, which it still retains. As, however, it would evidently be inconvenient to the bird to sleep on the wing, it was popularly supposed that the long filaments of the tail were conferred upon it to enable it to suspend itself head downwards from the branches of trees, in which somewhat uncomfortable position it was supposed to enjoy its repose. Several other absurd notions were also entertained regarding the habits of this bird, all arising from its assumed imperfections. To these we need not refer.

The appearance of the male Bird of Paradise in his native forests is so beautiful, that those ornithologists who have had the opportunity of seeing him there, speak of it with the greatest enthusiasm. Of this, the following passage from the pen of the distinguished French naturalist, M. Lesson, may serve as an example:—"Scarcely had I proceeded a few hundred yards into these ancient forests," he says, "the sombre gloom of which is perhaps the most magnificent and imposing spectacle that I have ever seen, when a Bird of Paradise attracted my attention; it flew with grace, and in an undulating manner; the feathers of its sides formed a graceful and airy plume, which, without hyperbole, bore no distant resemblance to a brilliant meteor. Struck with surprise and admiration, I feasted my eyes upon this magnificent bird with inexpressible pleasure; but my disturbance was so great that I forgot to fire at him, and did not recollect that I had a gun till he was far away." The females, this author tells us, collect in bands at the summits of the highest trees in the forests, and cry out in concert to attract the males. The latter generally occur in the midst of a seraglio of about fifteen females, for whose delectation they display their beautiful plumage somewhat in the manner of the peacock. By a sort of vibration of the entire plumage, they raise the whole of their feathers until the long delicate plumes of the sides surround the birds almost completely like a golden halo, "in the centre of which," says M. de Lafresnaye, "the bright green head forms a disc, looking at the moment like a little emerald sun, with its rays formed by the feathers of the two plumes." A specimen of this bird, sent home by Mr. Wallace, and mounted in accordance with his descriptions, is one of the most splendid ornaments of the ornithological gallery in the British Museum. The drooping feathers of the lateral plumes scarcely justify their comparison with a halo; they rather remind one of the fabled fountain of golden water, which plays so important a part in one of the Arabian Tales. The cry of the male is described by Lesson as resembling the words, *voike*, *voike*, *voike*, *voiko*, strongly articulated. That of the female is similar, but weaker.

THE LITTLE EMERALD BIRD OF PARADISE (*Paradisea papuensis*) is about an inch shorter than the preceding species, the one measuring twelve, the other thirteen inches in length. The two birds are very similar in colouring, but the upper part of the back in the present species is yellow, and the lateral plumes are rather shorter in proportion. This is a more abundant species in New Guinea than the preceding one, and is commonly imported into Europe for the purposes of ornament.

THE RED BIRD OF PARADISE (*Paradisea rubra*) has the face, the sides of the neck, and the throat covered with small velvet-like black feathers, exhibiting an emerald and golden lustre. The back of the head and neck, the upper part of the back and of the breast are yellow; the shoulders and back are cinnamon red, and the wings, rump, and belly, chestnut brown. The plumes of the sides, which are of a closer texture than in the Emerald Bird of Paradise, are rather longer than the bird itself, and of a most brilliant carmine red colour; the tail is furnished with two very long filaments, which, however, are curled up for a considerable part of their length. The whole length of the bird is about thirteen inches. The female is destitute of the lateral plumes and caudal filaments, and has the face and throat chestnut colour instead of black. This bird is an inhabitant of the island of Waigiou.

THE GOLDEN-BREASTED BIRD OF PARADISE (*Parotia aurea*), a native of New Guinea and Waigiou, is of about the same size as the preceding species, but is easily distinguished from all other known Birds of Paradise by the presence of six long filaments springing from the head, three on each side, measuring about six inches in length, and bearing at their extremities a few barbs, which form a small flat palette. The colour of these filaments and palettes is black, as is also the rest of the velvet-like plumage, except on the throat and the upper part of the breast, which are covered with scale-like feathers, exhibiting the most brilliant golden, coppery, and green tints. The frontal plumes are erect, and white at the tip, forming a sort of pearly-gray tuft on the front of the head; and the flanks are covered with a dense tuft of rather elongated, black decomposed feathers, which conceal the wings. The female exhibits two ear-like tufts on the head, in the place of the singular filaments of the male. Her plumage is black, becoming sooty-brown on the back, and chestnut-red on the rump; her chin is reddish-brown, chest pale-tawny, and belly reddish, marked with deep brown longitudinal streaks.

THE SUPERB BIRD OF PARADISE (*Lophorhina superba*) is smaller than any of the preceding species of this family, measuring only about nine inches in length. It is distinguished by having a small tuft of black plumes springing from each nostril. The plumage of this splendid bird is black, presenting green and purple glosses in different lights; the front of the neck and breast are covered by a sort of breastplate of imbricated feathers, hanging down in front and terminating in a wide fork. This breastplate exhibits the most brilliant tints of bronzed green and violet; from the sides of the neck spring numerous plumes, gradually increasing in length, and of a rich violet black colour, which form a sort of mantle, partly concealing the wings. Of this species, which is one of the rarest of its family, the female is unknown. It is an inhabitant of Waigiou and New Guinea.

THE KING BIRD OF PARADISE (*Cicinnurus regius*) is a still smaller species, measuring less than six inches in length. It is of a bright red colour above, and the whole of its plumage is of a velvet-like softness, both to the eye and to the touch. The plumes which clothe the nostrils and the forehead are of a fine orange colour; at the angle of the eye there is a small black spot; the chin and throat are brilliant yellow, bounded beneath by a transverse brownish streak, below which is a broad band of metallic green; the rest of the lower surface is white. On each side of the body, beneath the wings, there is a broad, flat plume of feathers, forming a sort of fan, in which each feather is truncated at the extremity. These feathers are gray, but towards their tips they are traversed by two bands—one white, the other red; and beyond these bands the extremities of the feathers are brilliant emerald-green. From the tail, which is reddish-brown, spring two long, naked, red filaments, which acquire barbs towards the extremity, where they are rolled up in a spiral form; these filaments are curved in such a manner as somewhat to resemble those in the tail of the Lyre-bird. The female is reddish-brown above, and reddish-yellow, finely streaked with brown, beneath. This rare bird is a native of New Guinea.

THE MAGNIFICENT BIRD OF PARADISE (*Diphyllodes magnifica*), which is likewise known only as an inhabitant of New Guinea, measures about eight inches in length, and is distinguished by the presence on each side of the neck of two peculiar tufts of feathers. The uppermost of these tufts consists of small, narrow, yellow feathers, each with a black spot at the tip, which stand out nearly at a right angle from the neck; the lower tuft, which is larger, but less prominent, is composed of long, detached barbs, springing from short tubes; they are of a straw colour, and truncated at the extremity. The front of the neck and breast are marked with alternate transverse lines of bright green changing to blue, and dark green; the colour of most of the rest of the plumage is brown; the wings are reddish-yellow, and the head exhibits a metallic lustre. The tail is furnished with a pair of filaments about a foot in length, which terminate in a fine point, and exhibit brilliant blue and green tints. The female is unknown.

THE INCOMPARABLE BIRD OF PARADISE (*Astrapia nigra*).—The name of Incomparable was given to this bird by Le Vaillant on account of the great beauty of its plumage, in which it seems to exceed all the other species of this magnificent family. Its body is about nine inches long; but the middle feathers of its elongated tail measure more than twice this length; they are rounded at the extremity, so that the apex of the tail exhibits a strong notch, and the remaining tail-feathers, which gradually diminish in length, are applied beneath them, in such a manner that the tail appears to consist only of these two feathers. The feathers of the sides and back of the head are elongated and silky, and carried back on the sides of the neck so as to form a sort of double crest; the colour of the head is black, with a brilliant greenish gloss. The back of the neck and the back are of a brilliant golden greenish-bronze colour, exhibiting a wonderful play of tints when viewed in different lights; the feathers of these parts are firm and imbricated, resembling the bright scales of a fish. The front of the neck is also clothed with scale-like feathers, forming a sort of gorget; the centre of this gorget is of the same colour as the back, but it is bordered by a sort of collar of the most brilliant colours—ruby-red, golden-orange, and violet. The remainder of the lower surface is of a deep, lustrous green colour. The wings and tail are violet black, but the feathers of the latter are marked beneath with transverse bands of brown. This splendid bird, which is exceedingly rare in collections, is a native of New Guinea. The female is still unknown.

FAMILY III.—STURNIDÆ.

The third family of the Conirostral birds includes our common British Starling and a great number of other interesting species. These birds have a long and compressed bill, of which the upper mandible is nearly straight to the tip, where it is usually more or less curved downwards. Near the apex also the edges of the upper mandible generally exhibit a slight notch. The wings in the Starlings are long and generally pointed; the tarsi are of moderate length, stout, and covered in front with broad shields; the toes are long and tolerably powerful, the hinder one especially being of considerable length and stoutness, and the outer front toe is united to the middle one as far as the third joint.

It is impossible to mistake the close alliance of these birds with those of the family Corvidæ, with which they have much in common both in their structure and habits. They are for the most part sociable in their habits, collecting in flocks, especially during the autumn and winter; and even during the breeding season they are generally to be seen in company. Their food consists of worms, insects, fruits, and grain—articles which also constitute a considerable portion of the diet of the Crows; but the Starlings do not appear to imitate the latter birds either in their taste for carrion or in their predatory propensities. They are, however, sagacious birds, and become docile and amusing in captivity, when some of them may be taught various tricks, and even to speak a few words.

THE COMMON STARLING (*Sturnus vulgaris*), Plate 12, fig. 40.—This well-known bird, which occurs abundantly in almost every part of the British isles, is also an inhabitant of the continent of Europe, and appears to be generally distributed over the whole of the eastern hemisphere. It is a handsome bird, its black plumage exhibiting tints of purple and green, according to the direction in which the light falls upon it, and being also adorned with numerous spots and streaks of buff and pale reddish-brown. In the autumn the Starlings collect into large flocks, consisting of old and young birds, which fly together in search of food, and roost together at night. Sometimes many of these flocks select some mass of trees as a common roosting place, to which they come, night after night, in thousands, until at last, from the accumulation of excrement, the place becomes most offensive. The food of these birds consists of worms, insects, slugs, and snails, together with berries and seeds, the latter especially during the autumn and winter. In pursuit of insects and worms, they may constantly be seen in small parties upon meadows and lawns, sometimes in company with rooks and other birds. When thus engaged, they run by the alternate movement of their feet. The nest is built in a hole in some rock or building, or occasionally in a hollow tree, and the Starling is accused of building sometimes in pigeon houses. The materials of the nest are small twigs, straw, grass, and roots. These appear to be collected and arranged principally by the female. The eggs are four or five in number, and of a beautiful pale blue colour.

In confinement the Starling is an intelligent, docile, and sprightly bird, which may be taught many tricks, and exhibits a good deal of resemblance to some of the Crows in his disposition. He will learn to whistle short tunes, and even to repeat a few words, although, notwithstanding the celebrity he has acquired in this respect from Sterne's well-known story, his power of imitating the human voice is far inferior to that of the raven or the magpie.

THE ROSE-COLOURED PASTOR (*Pastor roseus*), a common bird in Asia and Africa, is also met with in the south of Europe, and specimens have occasionally found their way into this country. It is of the same size as the Common Starling, namely, eight inches and a half in length; the plumage of the body is of a delicate rose colour, and the head, neck, wings, tail, lower tail-coverts, and legs, are black, with a blue gloss. The feathers of the crown of the head are elongated, so as to form a sort of crest. In its habits this bird resembles the Starling, associating in large flocks, and feeding upon insects, worms, and grain. From the great quantities of insects, especially locusts, which these birds destroy, they are in some places regarded almost in the light of sacred birds. Like our Starlings, they exhibit a great fondness for the vicinity of cattle and sheep, upon which they are nearly constant attendants, and this habit is alluded to in their name of *Pastor*. Their principal object in frequenting the society of cattle is to seize the insects which are disturbed by them from their resting-places in the grass; but the Pastors also frequently perch upon the backs of cattle, and seek for the parasitic insects which infest their hair.

THE COMMON MYNAH (*Acridotheres tristis*), which is very nearly allied to the preceding, is a native of India, where it is a very abundant and familiar bird. Its habits present a sort of combination of those of the Starling and the Jackdaw. It is fond of the vicinity of cattle, like the Rose-coloured Pastor, and is very destructive to locusts and other insects. This bird is remarkable as having been introduced into the Mauritius in order to destroy the locusts with which that island was infested at one time. It has performed its part so thoroughly, and increased to such an extent under the fostering care of the government, that insects are now very rare in the Mauritius. The nest is built in the hole of a tree, or in some nook about a house or other building.

THE BANK MYNAH (*Acridotheres ginginianus*), another abundant Indian species, is remarkable for digging deep holes in the banks of rivers for the reception of its nest. In other respects it resembles the preceding species.

THE AMERICAN MEADOW LARK (*Sturnella Ludoviciana*).—The bird known as the Meadow Lark in the United States is a species of the present family, nearly allied to the common Starling. It is found throughout the eastern part of North America, from Canada to Florida. This bird is about two inches and a half in length; its plumage above is elegantly variegated with black, yellow, and bright bay; the lower surface, and a line from the eye to the nostril, are rich yellow; across the front of the neck there is a crescent-shaped deep black band, and the four outer tail feathers on each side are white.

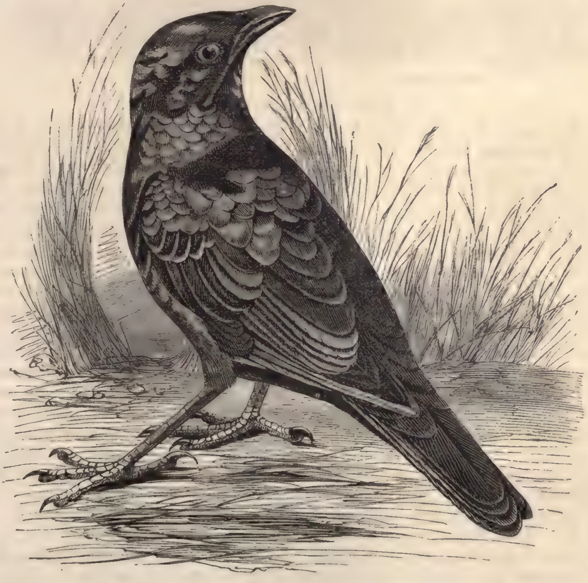
In its habits the American Meadow Lark presents a considerable resemblance to our Starling, collecting together in flocks, except during the breeding season, and feeding upon insects, worms, and seeds. When these birds perch on trees, they generally select the highest branches, and on alighting send forth a long, clear, melancholy note of great sweetness. They select a very different situation for their nests from that chosen by the Starling, building a structure of grass on the ground close to or within a bush or tussock of grass. During the autumn and winter they are much esteemed as an article of food; and as they fly in flocks, and are easily shot at this season, they are brought to market in great numbers.

THE WATTLED STARLING (*Dilophus carunculatus*), an inhabitant of South Africa, is chiefly remarkable for having the skin of the face quite bare of feathers, and produced into a pair of wattles, whilst another pair descend from the base of the bill along the front of the throat. These naked parts are black; the general colour of the plumage is reddish-gray, palest beneath, and the wings and tail are black, with a variable bronzed lustre. The length of the bird is ten or eleven inches. This bird is gregarious and noisy, and in other respects resembles the Starling; it frequents the herds of buffaloes and other cattle, and feeds on insects, worms, and berries. According to Le Vaillant, it has the cunning shyness of the crows, keeping carefully out of gunshot, while an unarmed man may approach it without exciting alarm.

THE OXPECKER (*Buphaga africana*), which is also sometimes called the *Beef-eater*, is a common bird in many of the warmer parts of Africa, where it follows the singular mode of life from which it has obtained its name. Perching upon the backs of oxen and other cattle, it sets to work busily to extract from their skins the larvæ of the œstridæ or bot flies, with which they are almost constantly infested, and which often give rise to painful tumours; it creeps about in all directions upon the body of the ox by means of its powerful feet, which exhibit some resemblance to those of a woodpecker, although the toes are in the ordinary position. The bill of the bird is well adapted for digging and squeezing out the larvæ; it is short and stout, and inflated towards the extremity. The cattle are said to submit with exemplary patience to the operations of the bird, as if aware of the benefit to be derived from them. The Oxpecker is a small bird, measuring between eight and nine inches in length; its plumage is reddish-brown above, and pale tawny beneath, with the belly nearly white; the bill is yellow at the base, and coral-red at the extremity. It lives in small bands, consisting of seven or eight individuals, and is very shy.

THE SATIN BOWER-BIRD (*Ptilonorhynchus holosericeus*).—None of the birds of this family are more deserving of notice than the Bower-birds of Australia, on account of the singular habits from which their name is derived. These birds construct a sort of bower or arbour of twigs, which they adorn in various ways, and then amuse themselves by running about and through their edifice as if enjoying the pleasures of a dance.

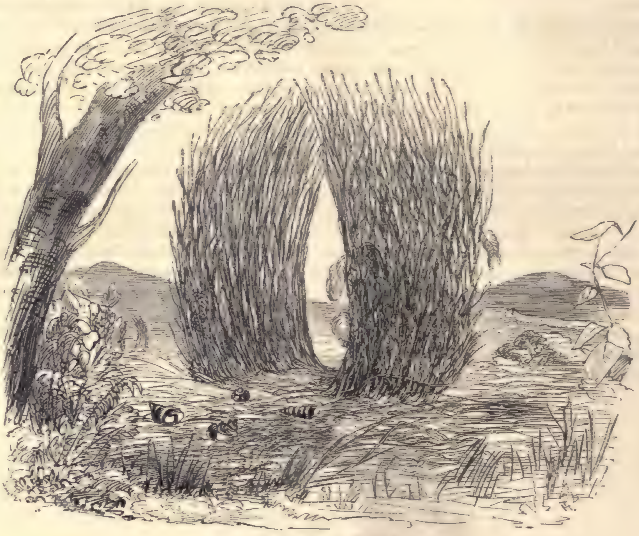
Fig. 115.



The Satin Bower-bird (Ptilonorhynchus holosericeus).

The Satin Bower-bird—fig. 115—which is an inhabitant of the forests of New South Wales, measures about thirteen inches in length, and is of a brilliant blue-black colour, with the wings and tail black, and the bill and feet yellow. The female is of an olive colour, with the wings and tail brown; the lower surface is streaked with black, and the front of the neck with white. The bower of this bird is placed under the sheltering branches of a large tree, and is described by Mr. Gould as consisting of a large platform of sticks firmly interwoven, on the centre of which the true bower is raised, this being composed of finer and more flexible twigs so arranged as to curve over, and nearly meet at the top; the materials being placed so that any forks on the twigs may project outwards, thus leaving a perfectly free passage for the birds through their singular edifice. This curious structure has nothing to do with the nest, but appears to be simply a place of resort for numerous individuals of both sexes, which play about the platform and run through the arch formed by the bower seemingly for the mere purpose of amusing themselves. These assemblies may, however, be in some way connected with the courtship of the birds, although Mr. Gould states that the bower is seldom entirely deserted. The platform and its vicinity are always ornamented with a variety of objects, such as shells and small bones, and the bower itself with bright coloured feathers. Scarcely anything seems to come amiss to the birds in the embellishment of their favourite resort, and the natives are so well aware of their habit of carrying off anything that they can fly away with, that on losing any small article, they seek it at the nearest bowers, not uncommonly with success.

Fig. 116.



Bower of the Satin Bower-bird.

THE AUSTRALIAN CAT-BIRD (*Ptilonorhynchus Smithii*), another of these curious little architects, is also a native of New South Wales, where it has received its name from its singular note, of which Mr. Gould says—"In comparing it to the nightly concerts of the domestic cat, I conceive that I am conveying to my readers a more perfect idea of the note of this species than could be given by pages of description;" and from what follows, it would almost appear that Mr. Gould considered the sound to be of a nature to sooth the exiled Londoner with reminiscences of home. The Cat-bird is of a green colour, more or less spotted with white. Its length is about eleven inches.

THE SPOTTED BOWER-BIRD (*Chlamydera maculata*) displays even more elegance of design in the preparation of its bower than the Satin bird. Mr. Gould describes the bowers of this species as "considerably longer and more avenue-like than those of the Satin Bower-bird, being in many instances three feet in length. They are outwardly built of twigs, and beautifully lined with tall grasses, so disposed that their heads nearly meet; the decorations are very profuse, and consist of bivalve shells, crania of small mammalia, and other bones. Evident and beautiful instances of design are manifest throughout the bower and decorations formed by this species, particularly in the manner in which the stones are placed within the bower, apparently to keep the grasses with which it is lined fixed firmly in their places; these stones diverge from the mouth of the run on each side, so as to form little paths, while the immense collection of decorative materials, bones, shells, &c., are placed in a heap before the entrance of the avenue, this arrangement being the same at both ends."

The constructors of this curious edifice inhabit the interior of the Australian continent. They are about the same size as the Satin Bower-bird, and their plumage is of a brown colour, elegantly spotted and variegated with yellow. The lower surface is grayish-white, with indistinct brown lines on the flanks; and across the back of the neck is a broad rose-coloured band, composed of somewhat elongated feathers, forming a sort of transverse occipital crest.

THE CAPE STARLING (*Amydrus morio*), an inhabitant of Southern Africa, is very common in the colony of the Cape of Good Hope, where it is known to the settlers under the names of Mountain Starling and Red-winged Starling. It is about eleven inches long, and of a shining blue-black colour, with the primary and secondary feathers of the wings reddish-brown, tipped with black, the bill black, and the feet brown. This bird flies in immense flocks, and feeds principally upon fruits. It is especially fond of grapes, and causes great damage in the vineyards in consequence of this predilection; in fact, without great vigilance on the part of the growers, the Starlings in some districts would completely ruin the crops of grapes. They build their nests in the clefts of rocks, lay from four to six eggs, and breed twice in the year.

THE JUNGLE GRAKLE (*Gracula religiosa*), an inhabitant of India and Ceylon, is about twelve inches in length, and of a brilliant black colour, with a violet and greenish gloss on some parts. Each of the seven last quills of the wings has a white spot on its outer margin, and behind each eye there is a naked membrane, of a rich yellow colour, which nearly meets that of the opposite side on the occiput. This bird is met with in the lofty jungle, where it does not appear to be either common or generally distributed; it is generally seen in small parties of four or five, frequenting the tops of the highest trees, and feeding on fruits and berries. It has a fine and varied song, for the sake of which it is often kept in confinement; it is also said to surpass all other birds in its power of imitating the human speech.

THE PURPLE GRAKLE (*Quiscalus versicolor*).—All the remaining birds of this family to which we have to refer are inhabitants of the Western hemisphere; they form a peculiar group confined to America, and distinguished from the other Sturnidæ by some peculiarities in the form of the bill and tail.

The Purple Grakle, which is also known as the CROW BLACKBIRD, is about twelve inches in length, and of a black colour, exhibiting blue, violet, coppery, and green tints on some parts of its plumage in certain lights. The bill is long and stout, and the inside of the upper mandible is furnished with a sharp process, resembling the broken blade of a penknife, which is no doubt useful to the bird in comminuting its food. This occurs in several other species nearly allied to the Purple Grakle.

This bird is migratory in its habits, visiting the United States of North America during the summer, and retiring, before the inclement season, to the warmer parts of the American continent and islands. Its depredations on the corn fields of the farmers are too great to render it a very welcome visitor; nevertheless, at their first arrival, these birds destroy immense numbers of caterpillars and grubs, "as if to recompense the husbandman beforehand," says Wilson, "for the havoc they intend to make among his crops of Indian corn." This, indeed, appears to be sufficiently serious to render some payment absolutely necessary, for the birds do not confine themselves to plundering the corn fields when ripe or nearly so, but attack the plants at all stages of growth. But it is when the ears are in a milky state that the greatest amount of damage is done. The Grakles, and some other birds, mostly near relatives of the present species, then descend in formidable bodies upon the fields, strip off the outer covering of leaves with which the ears are protected, and devour the milky grain with such avidity as to leave nothing but the cobs for the farmer. At this time the gun makes sad havoc among them, but the only effect of this persecution is to drive them to another field, or to another part of the same field, and, in some cases, these impudent plunderers succeed in devouring half the crop. In some places, Wilson tells us, the farmers generally allow one-fourth of the Indian-corn crop to the Blackbirds, among which the Purple Grakle comes in for a good share.

These birds roost on the cedars and pine trees, and build their nests on the highest branches of these. The nest is composed of mud, mixed with grass and roots, and lined with fine bents and hair. The eggs are about five in number, of a bluish-olive colour, spotted and streaked with black and dark-brown. Wilson states that the Purple Grakle frequently constructs its nest, and rears its young, in the interstices left between the large sticks in the nest of the Osprey, and that the two birds observe all the duties of good neighbourhood.

THE RUSTY GRAKLE (*Scolecophagus ferrugineus*) is also a migratory bird, and resembles the preceding species in its general habits. It is about nine inches long, and of a glossy dark-green or greenish-black colour, when adult; but the young males have the body plumage rusty, and the females are brown. This bird breeds in the extreme northern parts of the American continent, and only passes through the middle states on its journey to and from its breeding places. It winters in the southern states, and exhibits a strong predilection for Indian corn, although it cannot do the same damage to the crops as the preceding species.

THE BALTIMORE ORIOLE (*Yphantes Baltimore*), which is a summer visitor to the United States of America, receives its name from its black and orange plumage; those colours being the livery of Lord Baltimore, formerly proprietary of Maryland. Its colours have also procured it several other names, such as Fire bird, Golden Robin, &c. It is about seven inches in length, and has the head, throat, upper part of the back, and wings black; the remainder of the plumage is bright orange, becoming vermilion-red on the breast; the wing-feathers are edged with white, and the tail-feathers black and orange. The female exhibits nearly the same arrangement of colours as the male just described; but the black is brownish, and the orange tints are paler and duller.

The nest of the Baltimore Oriole is a beautiful pendulous structure, composed of fibrous materials neatly and strongly interwoven, and suspended from the flexible extremities of the branches of trees. Selecting two of these high up in a tree, the bird fastens strong strings of hemp or flax around them, and then proceeds to weave a sort of pouch of similar materials, so well worked up as to form a coarse cloth-like fabric. This pouch, which is six or seven inches in depth, is lined with soft substances, firmly interwoven with the outer coat, and the interior is finished with a layer of horsehair. The opening, which is at the top of the nest, is generally sufficiently protected by the overhanging leaves; but sometimes it is furnished with a horizontal cover. Almost any fibrous material seems to be welcome to this ingenious little weaver, when engaged in the construction of its nest; skeins of silk and hanks of thread are often carried off and worked into the edifice, and even the bits of soft band with which gardeners fasten their grafts and buds are sometimes purloined and used in the same manner. The eggs are five in number, of a pinkish white colour, marked at the larger end with purple dots, and on the rest of the surface with fine, irregularly intersecting, hair-like lines. The food of this bird consists principally of insects.

THE ORCHARD ORIOLE (*Icterus spurius*), a species nearly allied to the preceding, is, like it, a migratory bird, visiting the United States in the spring, and remaining there through the summer, when it takes its departure for the warm regions of the south. The male has the head, neck, breast, upper part of the back, wings, and tail black; the rest of the plumage bright chestnut. The female is of a yellowish-olive colour, with the back and wings brownish. The length of the bird is about six inches and a half.

The Orchard Oriole feeds principally upon caterpillars, grubs, and other insects; and hence, although he may sometimes plunder the farmer of his produce, his residence in the orchard, where he prefers taking up his abode, must be regarded as highly beneficial. Like the Baltimore bird, he constructs a pendent nest, usually suspending it from the twigs of an apple-tree. The nest is composed of a long, tough grass, "knit, or sewed through in a thousand directions, as if actually done with a needle." Wilson says that an old lady to whom he showed one of these nests, began to speculate on the possibility of teaching the bird to darn stockings! The nest is hemispherical, and about four inches in diameter by three inches in depth. When the bird selects the long pendent branches of the weeping willow for the support of its nest, the latter is made much deeper, and attached to several of the drooping twigs, which then hang down all round it, and effectually conceal it by their foliage. The eggs are generally four in number, of a very pale bluish tint, sparingly speckled with brown and spotted with purple.

THE CRESTED ORIOLE (*Cassicus cristatus*).—This bird, with some nearly allied species, is distinguished from the other members of this family, by having the base of the bill produced upwards on the forehead in the form of a disc. It is about the size of a magpie, and is of a black colour, with a loose crest of reddish feathers on the back of the head, the rump and vent reddish, and the outer tail feathers yellow. The bill is yellow, and the feet are black.

The Crested Oriole is an inhabitant of Cayenne and various parts of South America. It constructs a pensile nest, composed of various vegetable fibres well interwoven, forming a large pouch measuring about three feet in length and ten inches in diameter at its lowest part; the entrance is at the top, and the bottom is furnished with a thick bed of dry leaves. This bird is less sociable than some of its congeners; for D'Azara mentions six as the greatest number of nests of this species that he ever saw on the same tree, whilst Mr. Edwards, on his voyage up the Amazon, saw no less than forty-five nests of two other species (*C. icteronotus* and *C. hæmorrhoüs*) suspended from a single tree. These nests were about two feet in length, and hung so close together as to leave only a small portion of the top of the tree visible.

THE RED-WINGED STARLING (*Agelaius phœniceus*).—This bird, which, like the Purple Grakle, is most destructive to the corn-crops of the United States, is migratory in its habits, dwelling during the winter in immense flocks in the southern states, and advancing into the northern parts of the Union in the spring. The male Red-winged Starling is about nine inches in length; his plumage is glossy black, with the lesser wing-coverts scarlet. The female is nearly two inches shorter than her partner; she is black, mottled with pale brown and white above, and streaked with black and white beneath. In their winter quarters these birds find an abundant supply of food in the gleanings of the rice and cornfields; during the summer they are engaged in the business of incubation and bringing up their broods; but towards the commencement of September they are at leisure to commence their work of devastation amongst the Indian corn, the ears of which are then in a succulent, milky state, presenting an irresistible temptation to these and many other birds. Collecting in great flocks, the starlings then descend upon the fields, tear off the leafy coats with which the ears are protected, and soon clear out the young grain, leaving nothing but the chaffy cobs to the luckless proprietor of the field. It is to be observed, however, that this bird, like many other celebrated depredators, must be regarded as in some measure earning a right to his share of the farmer's produce by the multitude of grubs, caterpillars, and other insects, which he destroys during the breeding season, and of which Wilson justly remarks that their "secret and insidious attacks are more to be dreaded by the husbandman than the combined forces of the whole feathered tribes together."

The male Red-winged Starling has a short song, in which the notes *conk-quer-rèe* are most common; when taken from the nest, it is easily tamed, and may even be taught to pronounce a few words. Its nest is usually built in a thicket of alder bushes in a damp or marshy situation, and sometimes in a tussock of grass, or even on the ground; it is composed of rushes and coarse grass, and lined with fine bents. The eggs are generally five in number, and of a pale blue colour, marked with black lines and dashes.

THE COW-PEN BIRD (*Molothrus pecoris*), also called the COW-BUNTING, is remarkable in this group of birds for its habit of depositing its egg in the nest of some other bird, like our cuckoo. It is a migratory bird, making its appearance in the middle states of the American Union at the end of March or the beginning of April; it passes the winter in the southern states. The name of Cow-pen Bird given to this species is due to its habit of frequenting the inclosures in which cattle are confined; here it seeks for seeds, worms, and insects amongst the excrements of the cattle. It is never known to build a nest, but, as above mentioned, drops its eggs singly in the nests of numerous species of small birds, amongst which the yellow-throat and the red-eyed fly-catcher appear to be its greatest favourites; and in this selection it is justified by the great care which these birds take of their nurslings. The young Cow-bird, like the young of the European cuckoo, is always found alone in the nest of its foster parents, and probably resorts to the same means of getting rid of the rightful tenants of the nest that is adopted by the cuckoo, as it is found, that when the egg of the parasite is deposited in the nest before those of the owner, the latter deserts its nest, and thus the object of the intruder is defeated. It is a singular fact that the young of this bird, like that of the cuckoo, seems to possess some power of attracting to itself the affections of almost all other small birds, as these cannot see it in a helpless state, and wanting food, without immediately administering to its necessities. Wilson placed a young bird of this species in the same cage with a cardinal grosbeak; and the latter, as soon as his companion began to be clamorous for food, set to work to satisfy its appetite, and tended it like an affectionate nurse. When he found that a grasshopper, which he brought to his nursling, was too large for it to swallow; he broke it into small pieces which he passed through his bill to soften them, and then placed in the expectant mouth of the little Cow-bird with the greatest gentleness. The length of the Cow-pen Bird is about seven inches. Its plumage is black, with a greenish gloss; the head and neck are of a deep silky drab colour, and the breast violet. The female is of a brown colour, paler below.

FAMILY IV.—FRINGILLIDÆ.

The Finches, which form this family, present the most decidedly conical form of bill occurring amongst the Passeres. The bill is generally short and stout, but tapering to a fine point, and the edges of the upper mandible are destitute of the notches which occur near its tip in many of the birds of the preceding families of Conirostres. The tongue is rather fleshy, but horny and usually slit at the tip. The feet are slender; the tarsi are generally covered in front with seven horny plates, which, however, are sometimes amalgamated into a single long shield; and the toes are moderately developed, and terminated with rather slender curved claws. Amongst the vast number of birds belonging to this group there is some difference in the development of the wings, but these members are usually rather short. The tail is composed of twelve feathers. The Finches are all small birds, and exhibit much agility both in hopping upon the ground or amongst the branches of trees, and in flight. Their movement through the air is generally performed in a series of undulations, the bird rising by the action of its wings through a certain space, then closing its wings and descending for some distance. The food of the Finches consists principally of seeds, for the consumption of which the form of the bill is peculiarly adapted; they also pick up insects and worms, especially during the breeding season. Their adaptation to a diet of hard vegetable matters is further shown by the structure of their digestive organs, the œsophagus being dilated into a small crop, in which the seeds are stored and partially softened, and the stomach forming a powerful muscular gizzard fitted for the comminution of the food.

THE CHAFFINCH (*Fringilla cœlebs*)—Plate 13, fig. 44.—We commence with this well-known and handsome bird, as he is the type of the restricted genus *Fringilla*, which, with Linnæus, included all the species of the family known to him. The Chaffinch is generally distributed and abundant in all parts of Britain, where he is a permanent resident; in the colder regions of the north he is a migratory bird, passing southward at the approach of winter to seek a more genial climate for his residence during the cold season. At this time a considerable number of Chaffinches visit our island. Linnæus states that in Sweden the female Chaffinches migrate, but the males do not, and the specific name (*cœlebs*, or the bachelor) given by him to this bird, is an allusion to the lonely condition of these deserted males; it appears, however, that all the females do not migrate southwards, although those that remain seem to collect into distinct bands, and keep aloof from the males; this is the case also in the more northern parts of our own country, and female Chaffinches are more numerous in the south of England during the winter than at other times.

The Chaffinch resides in orchards, plantations, and hedgerows, and in the neighbourhood of these his note may be heard at a very early period of the year. It usually consists of a sharp repetition of a sound resembling the syllable *Fink* or *Pink;* from the former of these words the word finch is derived. Notwithstanding the imperfection of his musical powers, the note of the Chaffinch is generally a welcome sound from its association with the early spring, and the gaiety and sprightliness of the bird render him an almost universal favourite, except, perhaps, with some gardeners, for whose early radish seed, sowed at a period when food is probably rather scarce, he has so strong a predilection, that he will be down upon the bed almost as soon as the seed is covered in.

The nest is built in the fork of some bush or tree, and is a neat structure, composed of moss, adorned externally with fragments of lichens, and lined with wool, hair, and feathers. The eggs are usually four or five in number; their colour is pale buff, streaked and spotted with dark reddish-brown.

THE MOUNTAIN FINCH (*Fringilla montifringilla*) is a winter visitor to Britain, coming over in considerable numbers from Sweden and Norway. It is an abundant bird in the north of Europe in summer, and descends in the autumn as far south as the Mediterranean in quest of winter quarters; it has also been met with in Japan, and is probably an inhabitant of northern Asia.

It is nearly an inch longer than the Chaffinch, and is a handsome bird, having its plumage above mottled with black, brown, and fawn colour, and its lower surface white, with the exception of the throat and upper part of the breast, which are fawn colour. In this country the Mountain Finch frequents thick hedges, from which habit it has probably obtained its name of *Brambling* and *Bramble Finch;* it is seen feeding in stubble-fields in company with the Chaffinches, Yellow Hammers, and other finches.

THE GOLDFINCH (*Carduelis elegans*), the most beautiful of the British finches, and one of the most elegant of British birds, is so well known as a cage-favourite that any description of him is unnecessary. He is found abundantly in most parts of Europe, dwelling during the spring and summer principally in orchards and gardens, but, during the autumn and winter, frequenting the fields in large flocks to feed upon the ripe seeds of thistles, dandelions, plantains, and other wild plants. When thus engaged, the flock of bright-plumaged little birds presents a most pleasing spectacle; they may be seen clinging in every possible position to the stems of the thistles, picking the feathered seeds from their heads, or every now and then flitting from one patch to another, with an elegant undulating flight, accompanied by a continual twitter. The song of this bird is very agreeable and often well sustained, fully justifying the high estimation in which, notwithstanding his abundance, he is held as a cage-bird. He is also of a very familiar and docile disposition, soon becoming attached to those who feed and take notice of him, and readily learning to perform many little tricks.

The nest of the Goldfinch is a very pretty cup-shaped structure of moss, grass, fine roots, and twigs, often intermixed with other suitable materials, and lined with down, feathers, and hair. The female lays four or five pale bluish eggs, marked with a few purple and brown spots and lines.

THE SISKIN (*Carduelis spinus*), also called the *Aberdevine*, is a winter visitor to this country, arriving in considerable flocks from the high northern latitudes of Europe in the autumn. It is more abundant in the northern parts of Great Britain than in the south, but a few specimens appear to remain occasionally through the summer, and to breed even in the vicinity of London. In the highlands of Scotland a few pairs generally remain and breed. The male is rather more than four inches and a half in length; the top of his head is black, his back is greenish-olive, with a few longitudinal black streaks; the wing feathers are black, tipped and bordered with yellow; the tail is slightly forked, yellow at the base, and black at the tip; and the whole lower surface is yellowish-green with numerous black streaks, and the chin and throat black. The female is rather smaller than the male, grayish-olive above, and grayish-white beneath, streaked as in the male with black. The Siskin feeds upon seeds of different kinds, and has only a twittering note. It is, however, often paired with the canary by bird-fanciers, as the mules have a song which, unlike that of the canary, is not too loud to be borne in a room.

THE YELLOW BIRD (*Carduelis tristis*), an inhabitant of the United States, where it is also called the *Goldfinch*, is a small species, measuring only four inches and a half in length. The general colour of its plumage is a rich brown-yellow, becoming white towards the rump and vent; its wings and tail and the fore part of the head are black. This is the summer dress of the male; in the autumn his colour changes to a brownish-olive, in which costume he closely resembles his partner. The song of this bird resembles that of the European Goldfinch, but is much weaker. Its food consists of seeds, and like its European namesake, it is very partial to those of the composite plants, which it picks out of the heads whilst clinging to the plant in almost any position. The nest is a neat structure, usually placed amongst the twigs of an apple tree; the female lays five nearly white eggs, and usually rears two broods in the season.

THE CANARY BIRD (*Carduelis canaria*). This well-known bird, a native of the Canary Islands and of Madeira, has long been introduced into Europe, where it is now bred in captivity in great numbers, on account of its great power of song. Our caged canaries vary greatly in colour, some of them being of a nearly pure bright yellow, with only a whitish tinge on some parts of their plumage; whilst others have the wings and tail, or even the whole upper surface, more or less tinted with olive-brown. In the wild birds the brown colour predominates. In Madeira the Canary, according to Dr. Heineken, builds in thick bushes and trees, forming its nest of roots, moss, feathers, and hair; it lays from four to six pale-blue eggs, and breeds five or six times in the season. Even in the wild state it is a delightful songster; having, says Dr. Heineken, "much of the nightingale's and skylark's, but none of the woodlark's song."

It is not our intention to describe the different varieties of this admirable songster which have been produced in the course of a domestication extending now over more than three centuries. These will be found fully treated of, with a full discussion of all their qualities, in the works of the bird-fanciers, amongst which Bechstein's "Chamber birds" holds a leading place. The business of breeding canaries and mules, or hybrids between the Canary and other Finches (especially the Linnet and Goldfinch) is carried on to a considerable extent even in this country; but it is in Germany that it attains to its highest development. Here the birds are kept in large aviaries, and tended with great care, and it is from Germany that by far the greater portion of our best birds is derived.

THE LINNET (*Linota cannabina*), another well-known British Finch, is of a chestnut-brown colour above, pale-brown beneath, with the quill feathers of the wings and tail nearly black and edged with white; the male, during the spring and summer has the crown of the head and the breast bright red. Its total length is about five inches and three quarters. The female is a little smaller than the male, and has the upper surface rather paler, but variegated with patches of dark brown.

The Linnet is an abundant bird in the British islands, and is found very commonly in all parts of Europe, extending thence to the eastward as far as Japan. It does not appear to migrate, but collects in large flocks during the autumn and winter seasons. During the breeding season, the Linnets frequent furze-covered commons, and their nests are usually built in the thickest part of a furze bush. It is composed of small twigs and grass, and lined with wool, sometimes with the addition of hair or feathers. The eggs are four or five in number, and the birds rear at least two broods in the season. The Linnet feeds on seeds of various kinds, especially those of cruciferous plants; it is also partial to the seeds of flax, whence probably its name is derived. It has an agreeable song, for the sake of which it is very commonly kept in captivity.

THE REDPOLE (*Linota linaria*), which is nearly allied to the Linnet, is to a certain extent a migratory bird in this country; for, although it is a permanent resident in Scotland, and even in some of the northern counties of England, by far the greater number of those seen in Britain come to us in the autumn from the more northern parts of Europe. It is a diminutive bird, measuring little more than four inches in length; the general colour of its plumage is brown, palest beneath; the back is spotted with dark brown. The quill feathers of the wings are nearly black, but edged with pale brown; the chin is black, and the flanks streaked with dark brown. The forehead is deep crimson, and the breast of the male is strongly tinged with red.

This elegant little bird has a very wide geographical range, extending apparently throughout the northern parts of both hemispheres. It is found abundantly in the arctic regions, and even visits the inhospitable shores of Spitzbergen, near which several specimens alighted on Captain Scoresby's ship. During its winter residence in Britain the Redpole is seen in considerable flocks frequenting woods and plantations, where it feeds upon the seeds of various trees, especially the birch and the alder. Its nest is built in a bush or low tree, and is composed of moss, grass, and the down from the catkins of the willow; the latter substance also forms the lining, and furnishes a soft and warm bed for the eggs and young. It is a familiar and affectionate little bird, and may be easily trained to perform a few tricks, for which reason it is often kept in confinement, although its song is merely a feeble twittering.

THE MEALY REDPOLE (*Linota canescens*) is a larger species than the preceding, which it closely resembles in general appearance. It is found in the northern parts of both hemispheres, migrating towards the south for the winter; at which season it occurs, although seldom in any abundance, in Britain.

THE MOUNTAIN LINNET (*Linota montium*) also frequently called the *Twite*, is a common species in the north of England and in Scotland, where it dwells throughout the year and breeds, but makes its appearance in our southern counties only during the winter. It measures about five inches and a quarter in length, the same as the Mealy Redpole, but is of a more slender form, and furnished with a longer tail; and it has no red either on the head or the breast. This bird resides upon hills and mountains, and builds amongst the heath.

THE GREENFINCH (*Chlorospiza Chloris*) is one of the commonest of British birds, and is a permanent resident in the cultivated districts of our islands. It occurs in most parts of the continent of Europe, and is enumerated amongst the birds found by Kittlitz in the island of Bonin, situated more than four hundred miles to the east of Japan. It is distinguished from the preceding species by the stoutness of its short conical bill, in which character it somewhat resembles the Gosbeaks. The general colour of the plumage is yellow or yellowish, becoming olive-green on the back; the wing primaries are grayish-black, with two-thirds of their outer edges bright yellow; the tail-feathers are grayish-brown, with the basal half of all, except the two middle ones, bright yellow. The female is of a pale brown colour, more or less tinged with yellow and green. The male is rather more than six inches in length; the female a little smaller.

The Greenfinch frequents gardens, orchards, and woods, resorting in the winter to shrubberies and plantations of evergreens for protection from the inclemency of the weather. Its food consists of seeds of various kinds. Its nest is built in a hedge or bush, rarely in a tree, and composed externally of roots, moss, and wool, lined with fine root-fibres, hair, and feathers.

THE HOUSE SPARROW (*Passer domesticus*). This abundant and well-known British bird appears to be generally distributed over the whole northern part of the eastern hemisphere, and everywhere exhibits the same fondness for the habitations of man, so that, as Mr. Yarrell remarks, "from the thatch of the cottage of the peasant to the elaborately ornamented architecture of the palace of the prince, all buildings are alike subject to its intrusion." The nest of this bird is in fact built in any cranny that affords it a secure resting-place, and in London, and other large cities, the architectural ornaments of buildings are not unfrequently disfigured by the protrusion of straws carried into some sheltered nook by the sparrows. A curious example of this has been furnished by the crocodile, which forms one of the adornments of the pediment of the British Museum. The sparrows, with a great contempt for the skill of the sculptor, took it into their heads that the constantly open mouth of this stone-monster would furnish an excellent shelter for their nests, and accordingly carried in such quantities of straw that it protruded freely from between his teeth, as though he were engaged in the consumption of this somewhat unnatural food. Sometimes, however, the sparrow builds in some tree in a garden or orchard, composing its nest of hay and straw, and furnishing it with a dome; wherever the nest is made, it is always lined with a profusion of feathers. Sparrows usually rear three broods in the year, laying from four to six eggs at each time. They feed their young with great assiduity, principally upon caterpillars; and if we consider the number of those destructive insects which must be destroyed by them in the course of each summer, it will appear that they amply repay us for any plunder that they may commit in the corn-field and poultry yard. A singular and interesting instance of the attachment of sparrows to their offspring is given in the first volume of the "Zoological Journal," where it is stated that a pair of these birds, which had built in the thatch of a house at Poole, being observed to continue their visits to the nest, even until the winter had set in, it was found on examination that one of their young ones had been detained by a piece of string, or worsted, accidentally twisted round its legs; as it was thus prevented from going abroad to seek its own living, its parents had continued to feed it.

THE TREE SPARROW (*Passer montanus*) is a smaller bird than the house sparrow, to which it bears a considerable resemblance, but is usually found at a distance from human habitations, building its nest in the holes of trees, and similar situations, and also in the deserted nests of magpies and crows. It has, however, been known to breed in company with the house sparrow in the thatch of a barn, or about other farm-buildings. In its general habits this species resembles its more familiar relative, but it is by no means an abundant bird in England, especially in the southern counties. It is found in the northern parts of the European continent, and extends its range across Asia to Japan.

THE AMADAVADE (*Amadina Amandava*), a native of India, and other parts of tropical Asia, is a beautiful little bird, measuring about four inches in length, of which the rather long wedge-shaped tail makes up one third. It has a bright red bill and red irides; the lower surface is red, and the upper brown, with numerous pure white spots. It is a sociable little bird, and is caught in great quantities and imported into Europe, its lively habits rendering it an amusing cage-bird.

THE SPOTTED-SIDED FINCH (*Amadina Lathami*), which is generally distributed in the southern parts of Australia, is of a brown colour above, with the top of the head gray, and the rump and upper tail-coverts scarlet. The lower surface is white, with a broad band across the breast and the flanks deep black, each feather of the latter having a large white spot at the tip. The tail is black. The length of the bird is about four inches and a half. The food of this Finch consists principally of the seeds of grasses, which it seeks upon the ground. It is remarkable for building its nest not unfrequently among the large sticks forming the lower portion of eagles' nests, even during the period when the eagle is sitting; and the little Finches may be seen perched upon the small twigs close to their formidable neighbour, who, however, does not appear to do them any harm. At other times the nest is built on the branch of a tree, when it is constructed of grasses, in a nearly spherical form, with a short spout on one side giving access to the interior.

THE GOULDIAN FINCH (*Amadina Gouldiæ*), one of the most beautiful of the family of the Finches, is worthily dedicated by Mr. Gould to the memory of his wife, whose sympathy and aid had so much to do with the success of his earlier works. In this charming little bird the face and throat are black; the back of the head and neck are verdigris-green; the whole upper surface is yellowish-green, the lower surface rich yellow, with a band of a beautiful shining lilac-purple colour across the breast. The Gouldian Finch is a native of North Australia. It is still rare in collections, and nothing is known of its habits.

THE BEAUTIFUL GRASS-FINCH (*Poëphila mirabilis*), another North Australian species, is also a charming little bird. It has the head and face carmine red, the chin and throat black, and from the latter a narrow black line is given off, which borders the red of the back of the head. Behind this there is a narrow collar of pale blue. The back and wings are green, the rump and upper tail-coverts bright blue, the breast lilac, and the belly yellow. The primary quills of the wings and the central tail-feathers are blackish-brown. Of the latter the two middle ones are very long, and taper to a fine point. This last character occurs in the other species of *Poëphila*, of which several are found in Australia.

THE FIRE-TAILED FINCH (*Estrelda bella*), an inhabitant of New South Wales and Van Diemen's Land, is a pretty little species of an olive-brown colour above, and gray beneath, marked all over, but especially on the wings, tail, and lower surface, with transverse black lines. The rump and the base of the tail-feathers are scarlet; the centre of the abdomen is black; the eyes are surrounded by a black circle, from which a band runs to the base of the bill, and thence across the forehead, and the bill is crimson. This bird is seen in small parties both in the wooded gullies and in the gardens of the settlers, with whom it is a favourite. It feeds on the seeds of grasses and other plants which it picks up on the ground. The nest is of large size compared with its architect. It is domed, with an opening on one side near the top. The bird is sociable in its habits, several pairs usually building their nests close together on the same tree.

THE RED-EARED FINCH (*Estrelda ocula*), an abundant species in Swan River, is nearly allied to the preceding, from which, however, it is readily distinguished by a red spot behind each eye, and by its having the feathers of the lower surface black, with a large white spot at the tip of each, so that the abdomen presents a sort of black reticulated pattern upon a white ground. This bird inhabits swampy places, and feeds upon seeds.

THE JAVA SPARROW (*Oryzornis oryzivora*), which is well known as a cage-bird in this country, is a native of Java and Malacca, and is about the size of our Greenfinch, which it further resembles in the thickness of its bright red bill. It has a black head, with an oval white spot on each cheek; the plumage of the back and breast is of a fine bluish-gray, and that of the belly pale rose colour. The primaries and tail-feathers are black. In its native haunts it is said to be very destructive to the rice plantations, and hence the name of RICE-BIRD is frequently given to it.

THE WHITE-THROATED SPARROW (*Zonotrichia albicollis*), a native of the United States of North America, measures about six inches and a half in length, and has its plumage variegated with black, bay, ash-colour, and light-brown above; white beneath, with the breast ash-colour. The chin is white, and the head exhibits three white stripes. This bird winters in the southern states, where it haunts the rice fields, and advances to the northward in the summer to breed.

THE SONG-SPARROW (*Zonotrichia melodia*), another species nearly allied to the preceding, is only partially migratory in the United States, where it is a very common bird. Its song, which commences very early in the year, and is often continued throughout the whole summer and autumn, is described as very sweet although short, resembling the beginning of the Canary's song, frequently repeated. Its plumage is variegated with black, brown, and yellow above; the breast is marked with elongated pointed spots of dark chestnut; the belly is white. The length of the bird is six inches and a half. The nest is built on the ground under a tuft of grass; it is composed of grass, lined with horsehair, and contains four or five eggs.

THE SEA-SIDE FINCH (*Ammodromus maritimus*), another North American species, is found upon the low islands of the Atlantic coast of the States, running about upon the shore between tide-marks to pick up the minute marine animals and fragments of larger ones, which constitute its entire sustenance. Its flesh, as might be expected from this diet, has a fishy taste. The colour of this bird is brownish-olive, with the chin and belly white, and the breast ash colour streaked with buff. Its length is rather more than six inches.

THE INDIGO-BIRD (*Spiza cyanea*), is another migratory inhabitant of the United States. Its plumage is of a rich sky-blue colour, changing to bright green, with the wings and tail black. Its length is about five inches. Besides his beautiful plumage, the male Indigo-bird possesses an animated song, which he pours forth for several months during the spring and summer. His favourite haunts are gardens, clover-fields, and the borders of woods, where he is fond of perching on the top of a high tree, and singing vigorously for half an hour together; but his nest is usually built in a low bush, where it is attached to two twigs, one passing up each side. The nest is composed externally of flax, and lined with fine dry grass. The eggs are five in number, and of a pale-blue colour, with a purple blotch at the larger end.

THE PAINTED BUNTING (*Spiza ciris*), also called, from the beauty of its plumage, the *Nonpareil*, is an inhabitant of the southern states of the North American Union, where its gay dress, and the docility of its manners, render it a great favourite. It is from five inches and a half to three quarters in length; the male has the head and neck rich purple; the back yellow, tinged with green; the wings dusky-red; the rump and tail-coverts red; the tail purplish-brown or green; and the whole lower surface vermilion-red. The female is smaller than her partner, greenish-olive above and yellow below. The food of the Painted Bunting consists of seeds and insects, in search of which it frequents gardens, orchards, and rice-fields; its nest is generally built in a garden, often close to the house, composed of grass and lined with hair and fine roots. The male has an agreeable song.

THE COMMON BUNTING (*Emberiza miliaria*).—The name of Buntings is given to a considerable group of Finches, which indicate an approach to the Larks in some of their characters; they are distinguished by the presence of a peculiar knob in the palate, which is of service to the birds in breaking up the hard seeds constituting the greater portion of their nourishment.

The Common Bunting of this country is abundant in most of our cultivated districts, where it frequents corn-fields, and may often be seen perched on the sprays of the hedges, and uttering its somewhat harsh notes. Its nest is built at the bottom of the hedge under the protection of the brambles which usually flourish in such situations; it is composed of straw, grass, and roots, and lined with hair. The eggs are four or five in number, and of a pale reddish or purplish colour, with purplish-brown streaks and spots. During the breeding season, the Buntings live in pairs, but in the autumn they become gregarious, and during the winter associate in considerable flocks, with which chaffinches and several other kinds of small birds are often mixed. They frequently roost on the ground like the skylarks, and are caught with them in nets and brought to market for the table. The Bunting is a well-known bird in all parts of Europe. Its length is rather more than seven inches. It is of a pale-brown colour above, with longitudinal dark brown streaks; the quill feathers of the wings and tail are dark-brown with pale edges; and the lower surface is brownish-white, with numerous spots and lines of dark brown on the breast and flanks.

THE REED BUNTING (*Emberiza Schœniclus*), another British species, is easily distinguished by the deep-black colour of its head, chin, and throat; the feathers of the back are black, with reddish margins, and those of the lower surface white; a white collar passes round the back of the neck, and unites on each side with a white streak descending from the angle of the gape. Its length is about six inches. This bird, which is generally distributed in Europe, is a summer visitor to the more northern countries; it frequents marshy places, where it dwells and builds its nest amongst the reeds, rushes, and osiers.

THE YELLOW BUNTING (*Emberiza Citrinella*), commonly known as the YELLOW HAMMER, is also a common British bird, and occurs, like the preceding, in all parts of Europe. It measures seven inches in length, and has the head and neck, and the whole lower surface of the body bright lemon-yellow; the back, wings, and tail exhibit various shades of brown and black, with the feathers sometimes edged with yellow. This bird builds its nest upon or near the ground, usually under the shelter of some thick bush, composing it of moss, roots, and hair, very firmly interwoven. In the winter it is gregarious, and associates with other small birds, and in Italy it is caught in great numbers, like the following species, and fattened for the table.

THE ORTOLAN (*Emberiza Hortulana*)—Plate 13, fig. 45—a rare and occasional visitor to this country, is very abundant in the south of Europe, where, as just stated, it is in great esteem as a delicacy for the table. The Ortolans are taken in great numbers in nets, kept in a dark room, and fed with an abundance of oats and millet, upon which diet they soon become excessively fat. This bird is about six inches in length, and of a deep reddish-brown colour above, with the head greenish-gray; the lower surface is reddish-buff, with the throat and breast yellowish-green.

THE CIRL BUNTING (*Emberiza Cirlus*), another rare visitor to Britain, is usually seen only on the south coast, where, however, it not unfrequently breeds. It is a common species in the south of Europe. The plumage is of an ashy olive colour, with longitudinal black streaks; there is a yellow streak above, and another below each eye, separated by a black line passing through the eye; the back is reddish, the throat black, and the lower part of the neck and belly yellow. The length of this bird is about six inches and a half.

THE BLACK-THROATED BUNTING (*Euspiza americana*), a migratory species in the United States, has a considerable resemblance to the European yellow hammer, both in form and habits. It is six inches and a half in length, and has the head greenish-yellow, the back, rump, and tail rusty-red, partly streaked with black, and the lower surface dull-white, with a large, somewhat cordate, black patch on the throat. This bird frequents grass and clover fields, always building its nest on the ground, which is composed of dried grasses.

THE RICE-BUNTING (*Dolichonyx oryzivorus*) is also a summer visitor to North America, where it is very abundant. During the breeding season these birds are dispersed all over the country, feeding to a great extent upon insects and the seeds of various wild plants, but also occasionally attacking the young ears of wheat, barley, and Indian corn. When the young are able to fly, however, they descend in vast flocks upon the corn-fields, apparently giving the preference to oats, of which they consume great quantities, but in return, according to Wilson, often supply the farmer's table with a very delicious dish.

The Rice-bunting is seven inches and a half in length, and the male is of a black colour, with the back of the head cream-colour, and the lower part of the back, the rump, and scapulars white. The female is brownish-yellow, streaked with brownish-black on the back; and the male assumes a similar dress when the breeding season is over. The nest is built on the ground, of dry leaves and grass, and the female usually lays five eggs. While she is sitting, the male is very gay and active, and emits a singular but not disagreeable song.

THE SNOW-BUNTING (*Plectrophanes nivalis*).—The two species of Buntings to which we have now to refer —namely, the Snow-bunting and the Lapland Bunting —resemble the larks in the great length of the hinder claw, but have stout conical bills, like the preceding species. The Snow-bunting is a winter visitor to Britain, its summer place of abode being the extreme northern parts of both hemispheres, where it breeds and rears its young. It measures about seven inches in length, and has the top of the head reddish-brown; the back variegated with black and brown; the primary and secondary quill-feathers black, with narrow white edges; the wing-coverts and tertials white, the middle tail-feathers black edged with white, the three outer ones on each side white, bordered at the apex with black; and the lower surface white with a reddish-brown tinge on the breast and flanks. In summer the head becomes white, the back black, and the breast loses its reddish tint. This is the state properly called the Snow-bunting or Snow-flake; in other conditions of plumage, the birds are known as Tawny Buntings and Mountain Buntings.

In this country the young birds are the first to make their appearance, accompanied by females; the adult males come rather later. The birds are more abundant in the northern and mountainous parts of the country than in the south; they frequent elevated pastures throughout the winter, but descend in very severe weather to the oat-stubbles; or, if the snow lies deep, even to the sea-coast. They run readily upon the ground like the larks, and seldom perch. They breed among the rocks of the most northern islands, making a nest of dry grass lined with deer's hair and feathers; the young are fed upon insects and grubs. The food of the parent birds consists principally of seeds of various kinds and buds.

THE LAPLAND BUNTING (*Plectrophanes lapponica*) is a smaller bird than the preceding, measuring only six inches and a quarter in length. The male has the head, face, throat, and breast deep black; the nape of the neck bright chestnut; the feathers of the back, wings, and tail dark brown, with reddish-brown edges; and the lower surface white, extending up the sides of the neck to the back of the head, whence a narrow white streak is continued over each eye. The white sides of the breast and abdomen are spotted with black. The female has the black plumage of the head and breast edged with pale brown and gray, and the chestnut feathers of the neck with white.

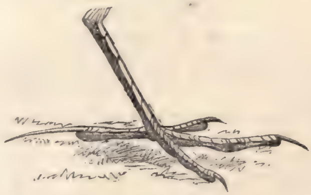
This bird agrees with the Snow-bunting in its wide distribution over the arctic regions, but is a far rarer visitor to this country, only a few specimens having been taken at various times in the lark nets. It breeds amongst moss and stones in the moist meadows bordering the arctic shores, composing its nest of dry grass and lining it with deer's hair.

THE SKYLARK (*Alauda arvensis*)—Plate 13, fig. 46.—This well-known and favourite British bird is an inhabitant not only of all parts of Europe, but also of Northern Asia, descending as far to the southward as the borders of India. It dwells commonly in cultivated districts, where it roosts and builds its nest on the ground, usually in corn-fields. Few, if any, of our British birds possess a more cheerful and animated song than the Skylark, whose joyous notes, heard as the bird soars perpendicularly in the air, have frequently afforded a theme for the poet; indeed the power of his song is most extraordinary, as it may be distinguished long after the little body from which it issues is lost to sight, and when we may, with little help from imagination, believe him, as Shakspeare has it, to be singing at "heaven's gate." In a wild state the lark seldom sings but when on the wing, and even in confinement he flutters his wings and presses against the wires of his cage, as if he would fain be soaring in the air. His song lasts for about eight months in the year; and during the summer he will sing the whole day through, from the very first appearance of dawn until after sunset; he also appears to be a long-lived bird, for Mr. Yarrell mentions an instance of one that lived nineteen years and a half in a cage.

The Skylark feeds upon seeds of various kinds, insects, and worms. Its nest is built upon the ground, under a clod of earth or tuft of herbage, in a corn-field or meadow. The materials of the nest are grasses of various thickness, and other vegetable fibres. The eggs are four or five in number, of a grayish-white colour with a greenish tint, mottled with dark-gray and brown; the bird generally rears two broods in a season. During winter the Skylarks assemble in great flocks, which may be seen sweeping over the fields, descending into the stubbles in search of food, and sometimes attacking the fields which have been sown with wheat. It would appear that at this season our British larks are reinforced by a considerable migration from the northern parts of Europe, and when the season is severe, many of those inhabiting Scotland pay a visit to the more southern parts of the kingdom. As they become fat during winter, unless the ground is thickly covered with snow so as to prevent their getting a sufficient supply of food, they are at this time regarded as a delicacy for the table, and are taken in great quantities at night, by dragging a net over the stubble-fields in which they generally roost.

In common with the other larks the Skylark has the hinder claw very long—fig. 117—the bill rather slender, and the tertial quills greatly developed, reaching, in fact, nearly to the apex of the wing when closed. In this last character they closely resemble the wagtails and pipits, the latter of which further agree with them in the elongation of the hinder claw, and in general appearance, as indicated in the names of titlark, pipit-lark, and tree-lark sometimes applied to some of them. Thus, we may regard the larks as constituting a point of junction between the great families of the finches and warblers, and of course, also between the Dentirostral and Conirostral groups of Passerine birds. The feathers of the back of the skylark are dark-brown, with pale-brown edges; those of the top of the head are slightly elongated, forming an erectile crest; the throat and breast are pale-brown with dark-brown spots, and the remainder of the lower surface is yellowish-white. The male measures seven inches and a quarter in length; the female is a little smaller, and rather darker in colour.

Fig. 117.



Foot of Skylark (Alauda arvensis).

THE CRESTED LARK (*Alauda cristata*) has a stronger and more curved bill than the Skylark, and is of a brown colour above, and pale yellowish-brown beneath, with the chin white, and the breast streaked with dark brown. The crown of the head is reddish-brown, and a few of the feathers are considerably elongated, forming a pointed crest. The length of this bird is six inches and three quarters. It is an inhabitant of most parts of the continent of Europe, but is rarely met with in Britain; its range also extends over the greater part of Northern Asia. In its general habits it resembles the Skylark, and it has a sweet and agreeable song.

THE WOODLARK (*Alauda arborea*) is distinguished from the Skylark by its smaller size, its length being only six inches, by its shorter tail, and by a streak of light brown, which passes over each eye. It is met with in cultivated districts, where there are numerous tall hedges, woods, and plantations, as, unlike the Skylark, it perches freely on the branches of trees. Its song is inferior to that of the Skylark in variety and power, but superior to it in sweetness; and it is emitted by the bird both when on the wing and when perching. Its nest is built on the ground. The Woodlark is not a very abundant bird in Britain, and is rather local in its distribution, and more plentiful in the southern counties. It is a permanent resident in Southern and Central Europe, and a summer visitor to Sweden, Denmark, and Russia.

THE SHORT-TOED LARK (*Alauda Calandrella*) is a rather smaller bird than the Woodlark, and is readily distinguished from any of the preceding species by the shortness of its toes, and especially of the hinder claw, which scarcely exhibits any of the disproportion characteristic of the larks in general. It is yellowish-brown above, with the centre of each feather darker; and white beneath. A single specimen has been taken in this country; but the true home of the species is in the southern and eastern parts of Europe and throughout Central Asia; it visits India during the cold season. When in good condition, it is caught in great numbers for the table in India, where it is known to the European residents as the Ortolan.

THE SHORELARK (*Otocoris alpestris*) is a northern species inhabiting the borders of the arctic seas in both hemispheres, and only descending into the more temperate regions in the winter. It is a rare occasional visitor to Britain. The Shorelark is about seven inches in length, and has the back brown, and the lower surface white; the forehead, chin, and throat are yellow; above the forehead is a black band, terminating on each side in a few elongated feathers which the bird has the power of raising in the form of a pair of pointed ears; the cheeks and a broad crescent-shaped band on the breast are black. This bird is most abundant in the fur-countries of North America, where it is seen in considerable flocks. Its nest is made amongst the moss and lichens growing on the rocks; and the bird sits so closely, and is so completely concealed by the similarity of its colouring to that of the surrounding objects, that a heedless passenger might almost tread upon it; but when any danger becomes imminent, it will flutter away as if lamed, so as to entice the intruder from the nest.

THE GINGI LARK (*Pyrrhulauda grisea*), a common species in all parts of India, resembles the Skylark in many of its habits, especially in frequenting and breeding in open cultivated grounds, and rarely, if ever, perching on trees. It is remarkable for the sudden ascents and descents which it performs in the air—rising to some height by a few flappings of its wings, then descending again almost perpendicularly, till it nearly touches the ground, and repeating this movement several times in succession. Its nest is built on the ground, usually in a small hollow. It is a small species, measuring only four and a half inches in length; it is of a grayish-brown colour above, and black beneath. It has a rather short, stout, and conical bill, and the hind claw is shorter than in the typical Larks.

SMITH'S FINCH-LARK (*Pyrrhulauda australis*) is an abundant species in the plains of Southern Africa, especially about the Orange River, where it flies in large bands. It has the head and all the lower surface black; the back reddish-brown, streaked with dark-brown; the wing-feathers bordered with red; the tail black, except the two middle feathers, which are brown; and the bill white. It is six inches in length.

THE CAPE SAND-LARK (*Certhilauda africana*) is an abundant bird upon the sandy districts bordering some of the bays of the Cape of Good Hope, where it perches upon the summit of a sand-hill, and emits a cry resembling the syllables *sirli*—the first much prolonged, which may be heard at a great distance. In its general habits this bird resembles our common lark, passing most of its time upon the ground, running about and picking up small seeds and insects. The female deposits her eggs upon the ground in a small hollow which she scratches at the foot of a shrub, and lines with a little dried herbage and a few feathers. This species is about eight inches in length, and is of a brown colour above, variegated with rusty-red and white; the lower surface is white, spotted with brown.

THE BULLFINCH (*Pyrrhula vulgaris*).—Our Common Bullfinch is the type of a group of Finches characterized by the short, stout, and somewhat compressed form of their bills, of which the ridge of the upper mandible is convex. It is an abundant species in most parts of this country, frequenting wooded and cultivated districts, and often exhibiting a great partiality for gardens and orchards. The Bullfinch is also a well-known bird all over Europe, and is included in the list of the birds of Japan. The male has the bill, the head and chin, and the quill-feathers black; the greater wing-coverts black, with their tips white, forming a band across the wing; the whole of the back bluish-gray, and the rump white. The lower part of the body is of a fine rich red colour. In the female the gray of the back is tinged with brown, and the red of the lower surface has a brownish-purple tint. The length of the bird is about six inches.

The food of the Bullfinch consists principally of vegetable substances, and during the early spring it is especially destructive to the buds of fruit-trees, exhibiting a decided and very provoking preference for the flower-buds. Hence, whenever it occurs in any abundance, it is regarded as an enemy by the gardener, and if left unmolested would often destroy all chance of fruit for the year. In the winter it feeds on the fruits of the wild rose and hawthorn, and on other fruits and seeds. The nest is not built until the beginning of May; it is usually placed in a thick bush or on the branch of a fir-tree in a secluded situation, and is composed of small twigs, lined with fine root-fibres. The female lays four or five eggs of a pale-blue colour, spotted and streaked with gray and purple. The ordinary notes of the Bullfinch are not musical, but the birds possess a remarkable talent for imitation, and when taken young may be taught to whistle many tunes with considerable accuracy. Their musical instruction is generally communicated by means of a bird-organ, and requires considerable time and care, as the birds must be in the habit of hearing the tunes that they are to learn constantly repeated for many months, in order that they may acquire them perfectly; and at the same time, when they begin to exert their own musical powers, they must be kept from hearing other birds, and assisted in their recollection, lest they should mix two airs together, or transpose the passages in any way. Hence a good piping Bullfinch necessarily fetches a high price. Great numbers of them are trained in Germany and imported into London every year.

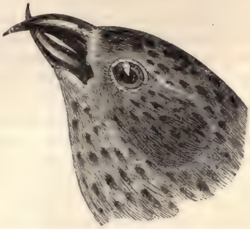
THE PURPLE BULLFINCH (*Carpodacus purpureus*) is of a deep-crimson colour, with the wings and tail black, and the belly white. The female is of a brownish-olive, streaked with black above, and with white on the head, and whitish below. The length of the bird is about six inches. This Finch is a native of the most northern parts of America, whence it migrates southwards into the more genial climate of the United States in the autumn. It feeds upon the buds of trees and berries.

THE PINE GROSBEAK (*Pinicola enucleator*)—Plate 14, fig. 47—another northern species, is found in both hemispheres dwelling amongst the pine forests, and feeding, like the preceding species, upon fruits, seeds, and the buds of trees. It is a very rare occasional visitor to Britain. The length of this bird is about eight inches, and the plumage of its upper surface exhibits a mixture of grayish-black and red—the dark colour occupying the middle of each feather, and the red the border. The wing-coverts are edged and tipped with white; the throat and breast are bright-red, and the abdomen gray. The Pine Grosbeak builds its nest on a low branch of a tree, composing it of small sticks and twigs, and lining it with feathers. The male has a pleasant song, and, when kept in confinement, has been known to recommence singing in the evening on the room being lighted up.

THE GREENISH GROSBEAK (*Spermophila falcirostra*) is an example of a genus, including a great number of South American species nearly allied to the bullfinch, and characterized by the great height of the bill, which has its upper ridge much curved. The present species has the plumage greenish, darkest on the back; the wings are brown, and the lower tail-coverts yellow. It is an inhabitant of Brazil, and dwells usually in the vicinity of human habitations, building a somewhat rude nest in the thickets, and feeding principally upon fruits.

THE CROSSBILL (*Loxia curvirostra*)—Plate 14, fig. 48.—This curious bird, which is an inhabitant of the pine forests of the northern parts of both hemispheres, and visits this country at irregular intervals in the autumn and winter, is remarkable for the structure of its bill, which, instead of being a simple cone like that of the finches in general, has both its mandibles curved in such a manner that they actually cross each other near the apex, and the whole bill has a peculiarly twisted appearance. This somewhat anomalous form of the bill, so different from anything we ordinarily meet with in birds, led some of the older naturalists into curious errors, Buffon, especially, venturing so far as to see in it a defect or mistake on the part of nature, which in reality existed only in his own imagination. He inferred, from the position of the mandibles, that the bird could never bring their points into contact so as to pick up seeds, and therefore, that it was compelled to take up all its food at the side of the bill. In this, as in so many other cases, the researches of subsequent naturalists have shown that the great French writer was rather too hasty in accusing nature of error, and that the beak of the Crossbill is really as perfectly adapted to its wants as that of any other bird—fig. 118—a great portion of its food consists of the seeds of the pines and firs, amongst which it dwells, and, in order to get at these, it has to wrench asunder the hard scales of the cones in which the seeds are concealed. For this purpose it insinuates the point of its bill between the scales, and then, by a powerful twisting motion, tears them asunder; the seed is then exposed, and the bird, in spite of Buffon, brings the tips of its mandibles together, picks out the seed, and eats it in the ordinary way. It is, of course, by the movement of the lower jaw that this effect is produced; and Mr. Yarrell, who has given a long description of its mechanism, states that the lower mandible of a specimen examined by him was capable of moving to a distance of three-eighths of an inch from the upper mandible, on the side upon which it lay in repose, although it could not be carried further in the opposite direction than so as to bring the two points into contact. The muscles of the lower jaw, on the side towards which it moves, are far stronger than those of the other side; and so great is force exerted by the bird, that Townson, who was one of the first to contravene Buffon's assertions, states that, on giving almonds in the shell to some specimens in his possession, they readily got at the kernels by first picking a small hole in the shell, and then wrenching off pieces with the lower mandible. The seeds of fir-cones are not, however, the only food of this bird, for it appears to have a liking for seeds of all kinds, and in this country, where it has made its appearance in autumn in considerable numbers, it has occasioned great destruction among the apples, which it splits with a single stroke of its bill, merely for the purpose of getting at the seeds.

Fig. 118.



Head of Crossbill (Loxia curvirostra).

Sometimes, although rarely, the Crossbill has been known to breed in this country, its true European home, as already stated, being in the vast pine forests of Germany and the northern parts of the continent. The nest is built among the branches of the pine trees, and composed of grasses, with a few twigs on the outside, and a lining of fine grass and hair within. The young birds in the nest do not present the peculiar crossing of the mandibles characteristic of the adult, this being unnecessary to them as long as they are supplied with food by their parents.

The general appearance of the Common Crossbill is shown in our figure above cited. Its length is about seven inches. In confinement it is very parrot-like in many of its actions, frequently climbing about the wires of its cage with the assistance of its hooked beak. In Germany, where they are abundant, these birds constitute a favourite article of food, and are regularly exposed for sale in the markets, as larks are with us.

THE PARROT CROSSBILL (*Loxia Pityopsittacus*) is a rather larger species than the preceding, measuring upwards of seven inches and a half in length, but in most respects closely resembles the Common Crossbill. It is an inhabitant of the European pine forests, and has only occasionally been seen in this country. It does not appear to occur in America.

THE WHITE-WINGED CROSSBILL (*Loxia leucoptera*), which is easily distinguished by the two white bands crossing its blackish wings, is, like the Common Crossbill, an inhabitant of the northern parts of both hemispheres, but does not appear to be abundant anywhere. It has occasionally been killed in England. The whole length of this bird is about six inches.

THE RARA (*Phytotoma Rara*), a native of Chili, is another of the large-billed Finches, but differs from all the preceding species in having the margins of the upper mandible finely toothed. It is a rather large species in this family, being about the size of a quail; its plumage is dingy-gray on the back, and lighter-gray on the lower surface. Its cry is rough, and resembles the name *Rara* given to it by the inhabitants of Chili. The food of this species consists of plants, and it has the "bad habit," as Molina calls it, of cutting these off close to the earth before eating them, so that, as it frequently cuts down far more than it requires for its consumption, it is regarded as an enemy by the peasants, whose fields it invades. This habit is alluded to in its scientific name, which signifies *plant-cutter*. Two other species are known, both inhabitants of South America.

THE SCARLET TANAGER (*Pyranga rubra*).—The Tanagers form a very numerous group of the great family of the Finches, considerably more than two hundred species of them being already described. They are all inhabitants of the warmer parts of America, where many of them are amongst the most brilliant ornaments of the forests. They are distinguished from the other Finches by the presence of a notch or undulation on each side of the upper mandible near the tip, on which account several authors have placed them amongst the Dentirostral birds in the vicinity of the Ampelidæ and Orioles; but their true affinities seem to be with the Grosbeaks, to which we shall next have to allude.

The Scarlet Tanager is one of the few species which visit the United States during the summer, when it even advances as far to the north as Canada. The male, which is about six inches and a half in length, is of a most brilliant scarlet colour, with the wings and tail black; the female is green above and yellow beneath, with brownish-black wings and tail; and the male, when the breeding season is over, moults and becomes partially of a greenish-yellow colour, so that his plumage exhibits a mixture of greenish and scarlet spots. This bird dwells in the depths of the woods and forests, and rarely approaches the habitations of man, except to visit the orchards in search of fruit, which constitutes a considerable portion of its food; the remainder consisting of insects of various kinds, including wasps, hornets, and bees. Its nest is built upon the horizontal branch of a tree, sometimes in an orchard; it is a slight structure, composed of dry grass and flax stems. The ordinary note of the male is a mere monotonous chirping, but occasionally he emits a more musical chant.

THE SUMMER RED-BIRD (*Pyranga æstiva*), another visitor to the United States, is entirely of a brilliant vermilion colour, with only the tips of the wings brown; the female being of a brownish-olive colour above and dull orange-yellow beneath. This bird is rather more than seven inches in length. In its habits it resembles the preceding species, dwelling principally in the woods, and feeding during the early part of the season upon insects, and subsequently upon berries and fruits of various kinds. It prefers those woods which contain pine trees, and is therefore more abundant along the coast of the Atlantic than in the interior.

THE BLACK TANAGER (*Tachyphonus leucopterus*), an inhabitant of Guiana, is entirely of a deep black colour, with the lesser wing-coverts white; the female is of a chestnut-red colour.

THE CRESTED TANAGER (*Tachyphonus cristatus*) is also black, with the lesser wing-coverts white; but it has the rump bright orange, and the flanks maroon, whilst the head is adorned with a crest which exhibits blue, red, and yellow colours. This species is likewise an inhabitant of Guiana.

VIGORS' TANAGER (*Tachyphonus coryphæus*), a native of the southern provinces of Brazil, is of a fine violet-black colour, with the scapulars white, and the crest red.

THE JACAPA TANAGER (*Tanagra jacapa*), an inhabitant of Brazil and Guiana, has the base of the lower mandible during life of a beautiful silvery whiteness; the male is purplish-black, with the head, throat, and breast brilliant purple; the female is purplish-brown above, and reddish beneath. The length of this bird is six inches.

THE RED-CAPPED TANAGER (*Tanagra gularis*), an inhabitant of Guiana, is black above, and white beneath; the head is of a brilliant red colour, and the throat blackish-purple.

THE SEVEN-COLOURED TANAGER (*Tanagra Tatao*), a native of Guiana and Brazil, where it is found in considerable troops in the vicinity of the great rivers, has the plumage of the upper parts deep velvety-black, with the head green, the rump orange-yellow, and the lower part of the back fiery red; the breast and greater wing-coverts are violet-blue, and the belly is sea-green.

THE BANDED TANAGER (*Calospiza vittata*)—Plate 13, fig. 43—a native of Brazil, is of a deep violet-blue colour above, with the rump, wings, and tail azure; a black band crosses the forehead and passes through each eye; the throat is yellowish-white, and the rest of the lower part of the body bright red.

THE TRI-COLOURED TANAGER (*Calospiza tricolor*) is of a blackish-brown colour above, with the margins of the quill feathers bright green; the nape and sides of the neck are greenish golden-yellow, the smaller wing-coverts violet-blue, and the breast and belly bluish-green. This species inhabits Brazil.

THE ORANGE-BREASTED TANAGER (*Calospiza thoracica*), which is also a native of Brazil, is remarkable for the beauty of colouring of the male. The plumage surrounding the base of the bill is velvet-black, the forehead displays a band of azure blue, the throat and breast are orange, with a velvet-black spot in the centre; the head and back are green, with spots and streaks of black; the shoulders are orange, spotted with black; and the belly is yellow, with the flanks grass-green.

THE GREEN-MIRROR TANAGER (*Nemosia flavicollis*).—In this beautiful bird, which is an inhabitant of Guiana and Brazil, the upper surface is blackish-brown, with the lower part of the back and the rump yellow; at the middle of each wing is a green mirror-like spot; the throat is golden-yellow; and the belly bright green.

THE ORGANIST TANAGER (*Euphonia musica*), a native of several of the West Indian Islands, and especially of Porto Rico and St. Domingo, is a small species, measuring only about four inches in length. It has the upper surface brilliant violet-black, with the top of the head and nape of the neck blue, and the cheeks blue-black; the forehead, rump, and lower part of the body are orange-yellow. The female is olive-green above, and greenish-yellow beneath. This bird, with some of its nearest allies, is remarkable amongst the Tanagers for its musical powers, for, although its note cannot be regarded as fine when compared with some of our best songsters, it has an agreeable and varied song. It is also a familiar species, often approaching the houses.

THE VIOLET TANAGER (*Euphonia violacea*), a species nearly related to the preceding, is found commonly in Brazil and Paraguay, and also in most parts of South America. It is of the same size as the organist tanager, and, like it, has the upper surface violet-black; the forehead and breast are orange-yellow, and the belly yellow. There are numerous other species of this and other genera of Tanagers, to which our space will not permit us to allude.

THE HAWFINCH (*Coccothraustes vulgaris*) is the only British species of another group of Finches, to which the name of Grosbeaks is ordinarily applied, from the great thickness of their rather short conical bills. The Hawfinch or Common Grosbeak is about seven inches in length, has the top of the head, the nape of the neck, the rump, and upper tail-coverts fawn colour; the back of the neck gray, the back chestnut-brown, and the lower surface pale nutmeg-brown; round the base of the bill there is a black line, from which a patch extends on each side to the eye; the throat also presents a black patch; the wings are black, with the larger wing-coverts white, and the fifth and four following primaries exhibit a very peculiar form, being notched at the tip on the inside, and terminated on the outside with elongated and curved barbs, which form a sort of hook. The tail feathers are black at the base and white at the tip, except the two middle ones, which are grayish-brown with white apices.

The Hawfinch is found all over Europe, abundantly in the southern and central parts of that continent, but more rarely towards the north. In this country it is pretty generally distributed, and remains with us throughout the year; but, from its extreme shyness, it is but seldom seen, and hence was long regarded only as an occasional visitor to Britain. Its favourite places of abode are the secluded parts of our woods and forests, where it feeds on seeds and berries, occasionally during the summer making a descent upon the gardens in the vicinity, to devour green peas, of which it appears to be very fond. In Epping Forest, according to Mr. H. Doubleday, the principal food of the Hawfinch is the seeds of the hornbeam. The nest of this bird is built sometimes in a bush, and sometimes amongst the branches of a tree; it is composed of twigs, intermixed with a larger or smaller quantity of fragments of gray lichen; the latter is never wanting, and sometimes constitutes the greater part of the nest. The materials are loosely put together, and the cavity is lined with fine roots and hair. The eggs are from four to six in number, of a pale olive colour, spotted with black, and streaked with gray. The only other known species of the genus *Coccothraustes* is the JAPANESE GROSBEAK (*C. japonicus*).

THE BLUE GROSBEAK (*Guiraca cærulea*), a native of the southern United States of North America, resembles our British species in its shy and retiring habits. It is of a rich purplish-blue colour above, with the wings and tail black. Its length is about six inches.

THE AZURE GROSBEAK (*Guiraca cyanea*), an inhabitant of Guiana, Brazil, and Paraguay, is of a sky-blue colour, with the cheeks black, and the wings blackish; the tail feathers are black, with the margins blue. The length of this bird is also about six inches.

THE ROSE-BREASTED GROSBEAK (*Guiraca ludoviciana*), a native of the United States, measures upwards of eight inches in length, and is of a black colour, with white spots on the wings, and white tips to several of the tail feathers; the lower part of the breast and the middle of the belly are rose colour. This handsome bird appears to be rather rare in the United States. Wilson states that it is observed in New York and New England, especially in the autumn, when it feeds on the seeds of the ripe berries of the sour gum. Its song is said to be mellow and clear.

THE CARDINAL GROSBEAK (*Cardinalis virginiana*), another North American species, receives his name from the general red colour of his plumage. He is dusky red above and bright vermilion beneath; a black band surrounds the base of his bill, his head is adorned with a large pointed crest, which he can elevate at pleasure, and his very strong bill is of a bright coral-red colour. The whole length of the male bird is eight inches. The female is a little smaller than her partner, and has the upper part brownish-olive, with the tail, wings, and tip of the crest red; the lower surface in this sex is reddish-drab.

The male Cardinal Grosbeak is a beautiful songster, and is often kept in cages in the United States, where his notes are so much admired that he is often called the Virginia Nightingale. The female is also said to possess a song but little inferior to that of her mate. The males, when confined together, fight violently, and Wilson says that the male will often destroy the female when both are kept in the same cage. This bird feeds on grain and seeds of various kinds, and exhibits a great partiality for maize. Its nest is usually placed in a bush, and composed of small twigs, dried herbage, and strips of bark, lined with fine grass.

THE THICK-BILLED GROUND-FINCH (*Geospiza magnirostris*).—Several peculiar species of birds, most nearly allied to the preceding, are found in the Galapagos islands, forming four genera, which have no representatives in other parts of the world. Of these the most remarkable are the Ground-finches, stoutly built birds with very powerful bills, of which the base of the upper mandible advances considerably upon the forehead. These birds feed in flocks upon the ground, usually in the dry and rocky districts near the coast, where, by scratching in the cindery soil with their powerful bills and claws, they obtain the seeds of grasses and other plants, which form an evanescent vegetation upon those desert shores during the rainy season. There are eight known species of this genus.

THE CLIMBING CACTUS BIRD (*Cactornis scandens*).—This bird resembles the preceding in its general structure, but possesses a much longer bill, very like that of the North American crow blackbirds in its form. It measures about five inches in length, and the male is of a sooty black colour, whilst the female is brown and spotted with white, especially on the lower surface. This bird is found principally about a peculiar species of cactus (*Opuntia Galapageia*), which grows abundantly upon the islands of the Galapagos group. Upon these plants the birds climb in every possible position, feeding both upon the fruit and flowers. They also not unfrequently descend to the ground in search of seeds, which they obtain in the same way as the ground-finches. Two other species of this genus have been described.

The habits of the two nearly allied genera (*Camarhynchus* and *Certhidea*) are not known; the former has a short and thick bill, like *Geospiza;* the latter has a slender bill, and presents a considerable resemblance to a Creeper (*Certhia*).

THE PHILIPPINE WEAVER-BIRD (*Ploceus philippinus*).—Several species of the Grosbeaks build a curious pensile nest, composed of the stalks of grasses very neatly and closely interwoven; but the most elegant structures of this kind are the nests made by some nearly allied Finches, to which, on this account, the name of Weaver-bird has been applied. They inhabit the warmer parts of the Eastern hemisphere, and one of the oldest known species is the Philippine Weaver-bird, a native of the Philippine Islands, as implied in its name, and also apparently identical with the species known as the *Baya* in India.

The Philippine Weaver-bird is a small species, less than six inches in length, of a brown colour above, and yellowish-white beneath, with the crown of the head, the neck, and the breast yellow. It is described as suspending its nest by a cord of considerable length from the branch of a tree, so as to be inaccessible to snakes and monkeys; the nest is said to contain a chamber for the male and another for the female, the former being situated close to the opening at the bottom of the nest, through which the birds obtain access to their snug apartments; here the male stations himself to watch over the safety of his family, and the natives believe that he attaches to the wall of his chamber a patch of soft clay, to which he fastens a fire-fly to serve as a night-light.

The Baya of India, which, if not identical with, is very nearly allied to the Philippine species, is better known, and, from the observations of the European residents in India, we can obtain more accurate information as to its proceedings. The nest of this species is usually suspended from the tips of the leaves of the fan-palm, where they are perfectly secure from all plunderers, but sometimes from the babul, a species of *Mimosa*, whose formidable thorns suffice to keep all intruders at a distance. It is composed of a mass of dried grass, closely interwoven, and looking externally like a gradually enlarging purse, of thirteen or fourteen inches in length, and about seven inches in diameter at the lowest part, where the true nest is situated. This consists only of a single chamber, the opening of which is at one side, access to it being obtained by means of a cylindrical passage hanging down from the bottom of the nest. The male has a separate, but less perfect nest of his own, and in this Mr. Layard always found two small masses of clay, attached one on each side of the perch occupied by the bird; the Cingalese asserted that these were for the reception of the fire-flies which they believe the male bird takes into his abode at the approach of night, but Mr. Layard was unable to ascertain anything about their use.

THE MADAGASCAR WEAVER-BIRD (*Ploceus pensilis*), called the *Neli-courvi* by Sonnerat, is of the size of our common sparrow, and of a green colour, with the head and throat yellow, the belly gray, the vent red, and the quill-feathers black. This bird builds its nest usually at the extremity of the leaves of a tree on the bank of a rivulet, composing it of straws and rushes, neatly interwoven into the form of a pouch, from one side of which there hangs a long cylindrical tube, serving as a passage to the nest, the opening being, as usual, at the bottom. This bird has the curious habit of returning year after year to the same spot and building a new nest attached to the bottom of the old one, so that as many as five nests may be seen thus placed one below the other. They are very sociable in their habits, as many as five or six hundred nests being sometimes suspended from a single tree.

THE ABYSSINIAN WEAVER-BIRD (*Ploceus larvatus*), a rather larger species, is of a yellowish colour, with the crown of the head, the throat and the breast black. It builds a pyramidal nest suspended over the water at the extremity of a small branch, and having the opening on one side of the pyramid, usually turned towards the east, the quarter from which the rain does not come. The interior is divided into two chambers by a partition; the innermost apartment is the true nest.

THE REPUBLICAN GROSBEAK (*Philæterus socius*), which is also a species of Weaver, is an inhabitant of Southern Africa, where it lives in vast societies. It is nearly six inches in length, and of a grayish-brown colour, paler or yellowish beneath; the face and throat are black, and there are numerous black spots on the flanks. These birds construct an enormous assemblage of nests under a common roof, placed amongst the branches of a tree; the roof is formed of a vast mass of herbage closely interwoven, so as to throw off the heaviest rain, and the separate nests or chambers occupied by the birds are appended to the lower surface and sides of the general mass, which are perforated all over with the small apertures through which the birds obtain access to their dwellings. It is said that the birds construct new chambers every year, so that the mass of materials is constantly increasing, and sometimes becomes so great as to cause the destruction of the tree. A large nest examined by Le Vaillant contained three hundred and twenty inhabited chambers. The same writer states that these birds do not pair, but that each male has several wives, each of which, in accordance with the ordinary custom of societies where polygamy is practised, has a separate residence of her own.

THE RED-BILLED TEXTOR (*Textor erythrorhynchus*), another South African species, nearly allied to the preceding, is nearly twelve inches in length, and is entirely of a black colour, with the bill coral-red, and the margins of the wing feathers white. It is remarkable, from its being found always about the buffaloes, feeding upon the numerous parasitic insects with which those unwieldy beasts are constantly infested. It also acts the part of a sentinel to the buffaloes; for, on the approach of any suspicious object, the Textor will suddenly fly up, and thus give timely notice to their quadruped friends of the vicinity of danger.

THE DIOCH (*Quelea sanguinirostris*), which appears to inhabit most parts of Africa, is a small bird, less than five inches in length; its plumage on the upper surface is variegated with black and brown, the former occupying the middle, and the latter the margins of the feathers; the breast and flanks are grayish-brown, with darker brown spots; the belly and lower tail-coverts are nearly white; the face and throat are blackish, the throat reddish, and the bill blood-red. This bird constructs a most ingenious nest, forming it of dried herbage neatly interwoven into a nearly spherical form, with one flat side, in which the opening is situated; the birds are said to soften and twist about the materials of their nest until they are fit to be woven into the fabric, and the male and female work in concert in its construction, one going inside the nest while the other remains outside, so as to pass the fibres through from one to the other without loss of time.

THE ANGOLA WHYDAH-BIRD (*Vidua paradisea*).—Several species of Finches, inhabitants of Africa, and nearly allied to the Weaver-birds, are remarkable for the great development of some feathers of the tail-coverts in the males during the breeding season. In the male of the Angola Whydah-bird, which is about the size of the Canary, the tail exhibits two feathers nearly a foot in length, drooping at the extremity like those of the domestic cock, and two others, which are considerably shorter, but furnished with very broad webs; these form a singularly elegant appendage. After the breeding season is over, these ornamental plumes are shed, and the two sexes are then very similar in appearance.

The Angola Whydah-bird is black, with the breast and belly orange-red. It is an inhabitant of Western Africa, and was originally brought to Europe from the kingdom of Whydah, whence the name Whydah-bird is commonly applied to it and its allies. This name has been corrupted into Widow-bird, and the French also call the birds of this genus *Veuves*, or Widows. The Latin generic name *Vidua* has the same signification. Other species inhabit different parts of Africa, living in considerable troops, usually in marshy places, where they build their nests close together in tufts of reeds and rushes.

FAMILY V.—MUSOPHAGIDÆ.

We have now only two other families of Passerine birds to illustrate, and these include comparatively few species. In both the characters seem to lead us towards the more typical forms of the following order, namely, the Parrots and Toucans.

The birds of the present family are all natives of Africa. They have a bill of moderate length, but of considerable thickness, broad at the base, compressed at the sides, and strongly arched along the ridge of the upper mandible, which has its edges notched near the tip; their tarsi are stout, scaled in front, and terminated by long and powerful toes, of which the outer one is versatile, a character which has induced many writers to place these birds amongst the Scansores.

THE VIOLET PLANTAIN-EATER (*Musophaga violacea*), the type of this family, is a large and handsome bird, about twenty inches in length, which inhabits the Guinea coast. It has a large bill, of which the base extends far up on the forehead; the nostrils are simple oval apertures placed on the sides of the upper mandible, considerably nearer to its apex than to its base; the tip of the upper mandible is much curved downwards, or somewhat hooked, and its margins are not only strongly toothed near the apex, but denticulated for a considerable distance from the point. The general colour of the plumage is a deep violet, tinged with blue on the upper parts, and dark-green on the breast and belly. From beneath each eye a curved white streak runs towards the back of the head, and the feathers of the latter part are short and of a deep crimson colour. The primaries are of a violet-crimson colour, and the large bill is orange-yellow at the base, gradually deepening in tint until it becomes red. This beautiful bird frequents the banks of the rivers of Western Africa, and feeds upon the fruits of the plantain and banana, whence the names of Plantain-eater and *Musophaga* applied to it.

THE GREEN TOURACO (*Corythaix persa*).—The Touracos are readily distinguished from the preceding form, to which, however, they are closely allied, by the smaller size of the bill, which does not advance upon the forehead; by the position of the nostrils at the base of the bill; and by the presence of a large and handsome crest upon the top of the head. The present species is of a grass-green colour, with the tips of the crest-feathers red; beneath each eye is a white streak; the wing-coverts are steel-blue, the quill-feathers bright red, margined with black, and the tail-feathers steel-blue. This, according to Messieurs Verreaux, is the bird described by Linnæus under the name of *Cuculus persa*. Our figure represents the following species, which is found, with the present one, in Southern Africa.

THE LOURI TOURACO (*Corythaix albocristatus*)—Plate 12, fig. 41 (*C. persa*)—exhibits the same general arrangement of colours as the preceding species, but has the tips of the crest-feathers white instead of red, and the eye surrounded with white. This bird, which inhabits the Cape of Good Hope, has little fear of man, and indeed allows itself to be impelled, by its curiosity, to approach any human intruders on its domain, and follow them from tree to tree, uttering what Le Vaillant regards as a cry of pleasure, resembling the syllable *cor*, with the *r* greatly prolonged. Its call-note is like the word *corow*, uttered eight or ten times in succession; and it has also a cry of fear, compared by Le Vaillant to the rapid sounds of a trumpet. The food of this bird, and of the allied species, consists exclusively of fruits, which it swallows whole when small enough. Its nesting-place is the hole of some large tree, in which the female deposits four bluish eggs. The male and female sit alternately, and both sexes bestow much care upon the young, which accompany their parents for some time after leaving the nest.

THE GIANT TOURACO (*Schizorhis gigantea*).—In this bird the bill is large, and much hooked at the tip, the margins of the upper mandible are undulated towards the apex, and the nostrils are placed at a short distance from the base of the bill, near the ridge of the upper mandible. The head is furnished with a crest of long feathers, which hang down at the back of the neck in repose. The plumage of the upper parts is brilliant blue; the crest is black, with a blue lustre; the breast is bright green, and the rest of the lower surface cinnamon-brown. The bill is orange colour. This bird, which measures about two feet in total length, is a native of the tropical parts of Western Africa, where it feeds, like the *Musophaga*, upon plantains and bananas. Several other species are met with in the same regions.

THE CAPE COLY (*Colius capensis*).—Several species of small crested birds, forming the genus *Colius*, are placed in this family by Mr. G. R. Gray; by others they have been arranged with the Fringillidæ. They have the hinder toe somewhat versatile, so that all four toes may be directed forwards, and the margins of the upper mandible are smooth. They are found at the Cape of Good Hope, and throughout Eastern Africa to Abyssinia, where they are abundant; at the Cape they are called *Muys-voogel*, or Mouse-birds, by the Dutch colonists, partly on account of their soft plumage, and partly from their mouse-like movements in the bushes. Their food consists principally of fruits.

The Cape or White-backed Coly measures rather more than six inches in length; it has the head, crest, and throat ashy-gray, the forehead black, and the upper surface pearly-gray, with a white band running from the middle of the back to the rump, where it terminates in a small tuft of purple feathers; the lower surface is reddish-white. The cry of this bird is described as resembling the syllables *qui-wi, qui-wi, quiwiwi*, strongly articulated. With its congeners it plunders the gardens at the Cape of Good Hope; descending upon these in great flocks, it attacks the fruits, the buds of the trees, and even the young shoots of the herbaceous plants, often destroying almost everything in the garden in a few minutes.

THE HOATZIN (*Opisthocomus cristatus*).—The true position of this curious bird must still be regarded as doubtful. Originally described as a pheasant by Linnæus, it has been shifted about by different authors between the Gallinaceous and Passerine orders—its singular structure presenting as it were a combination of the characters of both. It has a large convex bill, with the nostrils pierced in the middle of the upper mandible. The mandibles are denticulated *within* the margins, and the head is furnished with a large erectile crest. In these and some other particulars the bird would seem to approach the Musophagidæ, with which Mr. Gray and some other ornithologists place it; but, on the other hand, the feet are very gallinaceous in their character, the tarsi being reticulated, and the toes alone scutellated above. The hinder toe, also, is not versatile as in the other members of the present family, but the anterior toes are entirely divided, and not furnished at the base with those small membranes which are generally found in gallinaceous birds.

Whatever may be its true systematic position, the Hoatzin is undoubtedly a very remarkable bird. It is nearly as large as a peacock, which it resembles in many of its movements. Its plumage is tawny-brown, with numerous white spots and streaks upon the wings and tail; its breast is yellowish-white; the naked skin about its face and throat is bluish; and the elongated slender feathers which form the crest are white on one side, and black on the other. It is an inhabitant of Brazil and Guiana, where it lives in small flocks on the borders of the creeks and rivers. Its food is said to consist exclusively of the leaves of a particular species of tree, the *Arum arborescens* of Linnæus. The birds exhibit little fear of man; and, as their flesh possesses such a disagreeable odour, compounded of musk and castoreum, as to be quite useless for food, they are probably very seldom disturbed. The flesh is used in Guiana as a bait in fishing.

FAMILY VI.—BUCEROTIDÆ.

The birds of this family, to which the name of *Hornbills* is commonly applied, are at once distinguishable by the great size of their bills, which are often so enormous as to appear almost a deformity, whilst in many species the disproportion of this part to the rest of the body is increased by the presence of a singular helmet-like swelling at its base. The bill, with this appendage, looks a most ponderous and unwieldy burden for the slender neck of the bird, but the whole structure is usually composed of very slight materials—a thin outer case, supported by a multitude of interlacing walls, inclosing cavities filled with air; and so tender is the helmet-like protuberance in some species, that, after the death of the bird, a pressure with the thumb and finger is often sufficient to crush it in.

The bill is long, curved, and pointed, and the margins of the upper mandible are often irregularly toothed, as if small fragments had been broken out of them; the nostrils are placed at the base of the upper mandible; the anterior toes of the stout powerful feet are more or less united together, the outer one especially being attached to its neighbour to such an extent as to lead Cuvier to place the Hornbills with the Kingfishers and Bee-eaters in his group of syndactyle birds; and the front of the tarsi and upper surface of the toes are scutellated. These birds have tolerably large wings, and appear to possess considerable power of flight. They are also furnished with a long and broad tail, which is sometimes rounded at the extremity, sometimes very long and graduated.

The Hornbills are inhabitants of the warmer parts of the Old World, most of the species being found in the Eastern islands and in Africa. They are generally of large size. In a state of nature their food consists principally of fruits, but they are said by some writers to feast upon carrion when they meet with it, and specimens in confinement have been seen to capture rats and mice, which they swallowed whole, after crushing them a little between their enormous mandibles. They will probably feed upon almost anything that comes in their way. Lesson says that the Eastern species are very fond of nutmegs, from which their flesh acquires a delicious flavour. They usually live in flocks in the forests, where they are fond of perching upon the highest branches of the trees, and, like the birds of the following order, they nidificate in the holes of trees, which they enlarge to suit their convenience by the agency of their bills. During flight the head is drawn back, and the movement of the wings is very rapid, producing a considerable rushing sound as the birds pass through the air. This is heightened by a constant clattering of the large mandibles, and the occasional utterance of a loud croak. In fact, according to Lesson, the noise produced by a flock of Hornbills when passing along in the air is very alarming to those who are unaware of its origin; for it has no distant resemblance to the sound of one of those sudden and violent winds which often come on so unexpectedly in tropical countries.

THE RHINOCEROS HORNBILL (*Buceros Rhinoceros*)—Plate 12, fig. 42—is one of the largest species of this family, measuring about three feet in length, with a bill of about ten inches long. Its plumage is black, with the lower part of the belly, the legs, and the rump white; the tail, which is long, and broad at the extremity, is also white, with a broad black band crossing it beyond the middle; the enormous bill is red at the base, yellowish at the apex, and the upper mandible bears a very large appendage at its base, extending nearly half the length of the bill, and turning up at the extremity to form a sort of horn. This bird is found principally in the islands of the Eastern Archipelago.

THE MALABAR HORNBILL (*Buceros pica*) is about two feet six inches in length, and is likewise black, but has the whole of the belly, and the tips of the wing-feathers and of those of the tail, except the two middle ones, white; the appendage of the upper mandible extends more than half the length of the bill, of which its upper margin follows the curve; it is rounded above at the base, but becomes sharp-edged towards the apical portion, where it is crossed by a black band descending obliquely to the upper mandible itself, and running along the line of junction of the bill and its appendage. This species is common in India, and especially in Ceylon.

THE PHILIPPINE HORNBILL (*Buceros bicornis*) is of the size of a fowl, black above and white beneath, with the two outer feathers of the tail black. The bill is very large and stout, and nine inches in length; the appendage of the upper mandible is six inches long, reaches back beyond the eyes, and terminates in front in two projecting angles. This bird occurs in the Philippine Islands, and also in China and Sumatra.

THE FLAT-HELMETED HORNBILL (*Buceros hydrocorax*), which is likewise an inhabitant of the Philippines, measures about two feet and a half in length. It has a flat appendage to the upper mandible, which, with the bill, is bright red in the adult bird, with a broad black band surrounding the base; the back of the head, the neck, and a part of the breast, are reddish-chestnut; the remainder of the breast and the belly are black; the legs reddish; the back grayish-brown, and the tail-feathers tawny-white.

THE ROUND-HELMETED HORNBILL (*Buceros galeatus*) is remarkable for the great strength and solidity of the basal appendage of the upper mandible, which is of great size, but forms a simple protuberance at the base of the bill, rounded above, and cut off nearly straight in front; this helmet, with the corresponding part of the bill is deep red, the rest of the bill is yellowish. This is a large species with a greatly developed tail, of which the two middle feathers are much longer than the rest. It is an inhabitant of New Guinea.

THE ABYSSINIAN HORNBILL (*Bucorvus abyssinicus*) is a very large species, measuring about forty-five inches in length. It is of a black colour, with the wing-primaries white, and a red naked skin on the throat, which is also furnished with two wattles. The bill is about nine inches in length, and curved throughout as in the preceding species; it is furnished at the base of the upper mandible with a comparatively small semicircular casque of great delicacy. This bird is very common throughout Abyssinia, where it is known in different districts under the names of ERKOOM and ABBA-GUMBAH. It is said to feed entirely upon insects, especially locusts and beetles. The excrements of this bird, when applied to the crown of the head in bald people, are believed by the natives of Abyssinia to produce a fresh covering of hair.

THE RED-BILLED TOCKO (*Tockus erythrorhynchus*). The birds forming the genus *Tockus*, although very closely allied to the most typical Hornbills, are nevertheless distinguished from them by the total absence of any casque or excrescence at the base of the upper mandible. The present species, which is very abundant on the west coast of Africa, is about twenty inches in length, with a bright red bill of three inches and a half long. Its head is adorned with a tuft of slender plumes, which, with the whole of the back of the neck, are variegated with black and white; the back is black, variegated with white, the whole lower surface is pure white, and the tail is blackish-gray with the extremity white.

THE BLACK-BILLED TOCKO (*Tockus nasutus*), which is likewise a native of tropical Africa, is about the same size as the preceding species, from which it is distinguished by its black bill, with a spot of yellow on each side of the upper mandible beneath the nostrils. Its general colour is gray above and white beneath.

ORDER III.—SCANSORES.

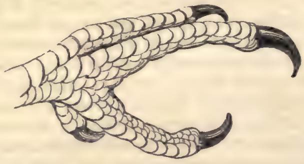
THE order of Scansorial, or climbing birds, is distinguished from the other orders of the class by a peculiar structure of the feet, as already indicated in our table of orders (p. 235), and under the order Passeres (p. 272). This peculiarity consists in the reversed position of the outer toe, which is turned backwards, so that the foot of a Scansorial bird exhibits two toes in front and two behind—fig. 119. This is really the only character common to all the birds placed in the order Scansores—the structure of the other parts, from which distinctive characters are usually derived, varying greatly in different members of the group—so that it includes birds of very different aspects and modes of life. It must be admitted also, that in several forms referred to the preceding order, the outer toe, although not permanently reversed, is reversible; so that the foot is capable of assuming the Scansorial character—adding not a little to the difficulty of drawing a clear line of demarcation between the two groups.

Thus, although we have here retained the order Scansores, as generally admitted by ornithologists, it is not without a feeling that a considerable proportion of its members might with propriety be arranged amongst the Passerine birds, either forming a distinct group of *Zygodactyli*, or *Yoke-toed birds*, or intermixed with the other families in accordance with their apparent relationships; and it may be as well to indicate the differences leading us to this view before proceeding further.

The Parrots, which may be regarded as the typical

Scansorial birds, exhibit characters which would seem to justify their being placed as an order by themselves. Their feet—fig. 119—are powerful, furnished with long grasping toes, and covered with a granular skin, rarely exhibiting scales or plates except towards the extremities of the toes. The latter are provided with soft pads beneath, and the whole foot is adapted for firmly clasping any object in the manner of a hand. In accordance with this structure, the great majority of the Parrots dwell in trees, upon the branches of which they cling and climb about in every possible position, the conformation of their feet rendering them almost as active in climbing as the monkeys, to which they must be regarded as analogous amongst birds.

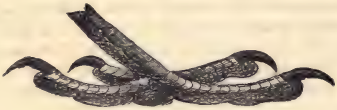
Fig. 119.



Foot of Common Parrot.

In the Woodpeckers, forming another principal group of these birds, the feet are differently constructed, and adapted for a very different kind of climbing. The tarsi and toes in the Woodpeckers are shielded in front—fig. 120. The toes are not fitted for grasping in the manner of those of the Parrots, but are long, and furnished with acute curved claws, by the agency of which the birds are enabled to cling firmly to the rough bark of trees, and thus to run rather than climb upon their trunks. By the reversal of the outer toes, two claws are brought behind in each foot, an arrangement which is of much use to the bird in running down the trunk of a tree with its head downwards, and the tarsus is depressed between the two hind toes, so as to form a sort of sole upon which the bird rests in ascending. The affinities of the Woodpeckers would seem to be with the Tenuirostral birds, if they are to be transferred to the Passerine order.

Fig. 120.



Foot of Woodpecker.

The Cuckoos and Toucans, which form the rest of this order, although furnished with Zygodactyle feet, do not appear to be truly Scansorial in their habits, but rather perching birds with Scansorial feet. The former might be placed with the Fissirostral birds, and the latter seem to approach the Hornbills. The four types just mentioned form the four families of this order. We commence with the Toucans.

FAMILY I.—RHAMPHASTIDÆ.

The birds of this family are distinguished, like those of the concluding group of the preceding order, by the great development of the bill, which is sometimes so large as to throw the bird himself completely into the shade; so that we cannot wonder at the name of *Tout-bec*, or *All-bill*, being applied to some of the Toucans by the French colonists of Guiana. The general form of the bill is very similar to that prevailing in the Hornbills, but usually rather less tapering towards the extremity. It is also destitute of those remarkable protuberances which give some of the Hornbills such a singular aspect. As in the Hornbills, however, the substance of the bill is cellular or spongy, so that, notwithstanding its apparently unwieldy bulk, it is too light to present any obstacle to the tolerably active movements of the birds. The margins of both mandibles are denticulated throughout their length, and the curved tip of the bill is ordinarily sharp. The tongue in these birds is perhaps more remarkable than the bill, being exactly like a feather. A strong cartilaginous stalk runs up the centre, bordered on each side with long and slender barbs, which are placed close together as in an ordinary feather, and increase in length as they approach the extremity of this singular tongue. The Indians of South America attribute extraordinary virtues to this feather-like organ, and employ it as a remedy in various diseases. The tarsi are short, but terminated by long and powerful toes, and the proportions of the legs and feet adapt the Toucans but badly for moving on the ground, where they cannot walk, but hop along with a very bad grace. Both the tarsi and the toes are covered with shield-like plates on the upper or anterior surface.

The Toucans are exclusively inhabitants of the warmer regions of America, where they abound in many parts of the forests. They are usually seen in small flocks, hopping from branch to branch of the highest trees. They are shy and cautious in their habits, and feed principally upon fruits, especially bananas, which they swallow whole. By some writers they have been said to throw the fruit upon which they feed up into the air, and then catching it with widely open bill, allow it to plunge down into the throat. It would appear, however, that their usual mode of proceeding is to take the fruit up between the mandibles, and then throwing the head back, leave it to roll down to its destination. They do not migrate, but wander about the country, making their appearance in greater numbers in certain districts, when some favourite fruit happens to be ripe there. Fruits, however, are not their only diet, but, on the contrary, they feed freely on animal substances, killing and devouring small birds and reptiles, plundering the nests of other birds of their eggs, and even occasionally making a meal upon fish, worms, and the larvæ of insects.

Even when in motion amongst the branches of the trees, the large beaks of the Toucans give them a certain air of gravity, but this is vastly increased by the attitude assumed by them in repose. When they perch quietly, they puff out their plumage until they look almost like a round ball of feathers; at the same time, the tail is thrown up over the back, the head is drawn back, and the enormous bill laid sometimes to one side, sometimes to the other, or moved from side to side, and raised and depressed in a manner resembling so much the gesticulations of an orator addressing a numerous assembly, says Loménie, that, coupled with the serious aspect of the birds, it has obtained for them, from the French creoles in Guiana, the name of *Oiseaux prêcheurs*, or "preaching birds." They breed in the holes of trees, usually taking possession of such as have been occupied and enlarged by the woodpeckers. Here they lay two eggs of a white colour and roundish form.

THE RED-BREASTED TOUCAN (*Rhamphastos dicolorus*)—Plate 16, fig. 55—which measures about eighteen inches in length, has the bill dark olive-green, with a yellowish-white band at the base; the plumage of the back, tail, and wings, black; the throat, and upper part of the breast, orange-yellow, bordered beneath with yellow; the lower part of the breast and the rump red; and the belly and legs black. This is a common species in Brazil and Guiana.

THE COLLARED TOUCAN (*Rhamphastos torquatus*) is of the same size as the preceding species, and like it has the plumage of the upper surface black; but the neck is surrounded by a red collar. The front of the neck is nearly white, spotted and streaked with red and black, the belly is green, and the vent and lower tail-coverts red. The bill in this species has the upper mandible yellowish-white, and the lower one black. This bird is an inhabitant of Mexico, where it is said to frequent the vicinity of the coast, and to feed to a great extent upon fish.

THE RED-BILLED TOUCAN (*Rhamphastos erythrorhynchus*), a large species, measuring upwards of twenty inches in length, is distinguished from the preceding by having the lower mandible and the lower part of the upper one red, the base of both and the top of the upper mandible being yellow, with a black band separating the yellow parts from the red. The general colour of the plumage is black; the throat is white, bordered with red at the bottom; the upper tail-coverts are yellow, and the lower ones red.

This species is a common bird in Guiana and Brazil. Along the course of the Amazon, according to Mr. Edwards, it and the ARIEL TOUCAN (*R. Ariel*), a species nearly allied to the one figured in our plate, are the most abundant forms of this family, occurring in vast numbers throughout the forests in the autumn. When they alight, and begin climbing about the trees in search of fruits, one of them acts the part of a sentinel, continually uttering a loud cry of *tucáno*, from which their name is derived. When the whole flock raise their loud and not over-melodious voices in concert, they produce a harsh scream, which may be heard at the distance of a mile. Mr. Edwards tells us that these birds, when tamed, may be taught as many tricks as a parrot, but they are destitute of the faculty of speech.

THE TOCO TOUCAN (*Rhamphastos Toco*), which is spread over Guiana, Brazil, and Paraguay, is a smaller species than any of the preceding, measuring only nine or ten inches in length. The bill of this bird, which is quite as large in proportion as that of any of its allies, is black at the base, and reddish-yellow for the rest of its surface, except the apex of the upper mandible, which is black; the plumage is as usual black, with the throat white, margined with red; the upper tail-coverts white, and the lower ones red.

THE ARACARI (*Pteroglossus aracari*)—Plate 16, fig. 56.—The Aracaris, forming the genus *Pteroglossus*, closely resemble the Toucans in their characters, but have a rather more solid bill, of which the upper mandible forms a rounded arch, without the distinct ridge, marked by a channel on each side, which is characteristic of the true Toucans. They also have a longer tail, of which the feathers are graduated.

The present species is nearly seventeen inches in length. Its colour above is dull green, with the head and throat black, and the rump scarlet; the breast is scarlet, with a broad black band; the flanks yellow, the belly and legs green, and the lower tail-coverts pale yellow. It is a native of Brazil and Guiana.

THE KOULIK ARACARI (*Pteroglossus piperivorus*), a well-known species in Cayenne, where it has received the name of *Koulik* from its peculiar cry, is about the same size as the preceding species. It has the head, neck, breast, and middle of the belly black, with a steel-blue gloss; the head has a yellow spot on each side, and the back of the neck an orange crescent; the back is olive green, the tail green above and brown beneath, and the lower tail-coverts crimson.

THE GREEN ARACARI (*Pteroglossus viridis*).—This is a small species, only measuring fourteen inches in length, including the bill. It is of an olive-green colour above, and sulphur-yellow beneath, with the head and throat black, and the rump bright red; the bill, which is upwards of three inches long, has the top of the upper mandible yellow, and the sides red, the two colours being separated by a black line; the lower mandible is black, and the serrated edges of both mandibles are white. It inhabits Guiana.

FAMILY II.—PSITTACIDÆ.

This family includes the numerous species of Parrots, which, as already stated, may be regarded not only as the most typical members of the order Scansores, but perhaps as entitled to rank as its sole representatives. These birds are, in fact, the only ones furnished with truly prehensile feet, which stand them instead of hands; with these the Parrots are not only able to grasp any object with great firmness, but actually in feeding often make use of them in place of hands to convey their food to the mouth. From this hand-like use of the feet, the arboreal and scansorial habits of the birds, and their general intelligence, which is perhaps greater than that of any members of their class, we may with some justice regard the Parrots as the analogues of the Quadrumanous mammals, and as occupying a correspondingly high position in the classification of birds.

The other distinctive characters presented by the Psittacidæ, besides their prehensile feet and reticulated tarsi, are to be found in the form and structure of the bill and tongue. The former is large and strong, with the upper mandible much longer than the lower one, strongly hooked, and terminating in an acute point. The base of the upper mandible is clothed with a cere, or naked skin, in which the nostrils are situated. The tongue is soft and fleshy, and generally terminates in a rounded knob, a structure very different from that prevailing in birds generally, and indicating, in all probability, a much greater acuteness of the sense of taste than usually prevails in this class.

These birds are found principally in the tropical regions of the globe, in some parts of which they swarm in prodigious numbers. Their great home is the continent of Australia, where they occur in vast quantities, and present a great variety of forms; but they are also numerous, both in species and individuals, throughout the Eastern islands and India, and many species are met with in the warmer parts of Africa and America. Their notes, especially those of the larger species, are generally harsh and discordant, but they make up for this defect in the beauty of their forms, and the brilliancy of their plumage, yielding, in the latter particular, to few members of their class; hence many of them are frequently imprisoned in cages, and some of these are able to add a further accomplishment to those conferred upon them by nature, by the facility with which they learn to speak, and to perform various curious and grotesque antics. In a state of nature most of the Parrots feed upon fruits, to which some add seeds and even nuts, the latter being easily broken up by their powerful bills; a few small species live upon the ground, and derive nearly their whole subsistence from the seeds of grasses and other plants. They nidificate in holes of trees, which they enlarge to suit their purpose by means of their strong gouge-like bills.

THE SCARLET MACCAW (*Macrocercus Macao*)—Plate 14, fig. 49.—The Maccaws, which are peculiar to the hot regions of South America and the West Indian Islands, are at once distinguishable by the enormous size of their bills, of which the upper mandible is so much curved as to describe nearly a semicircle, and also by the naked skin, furnished with only a few scattered and minute feathers, which covers their cheeks.

Some of these birds are amongst the most splendid of their tribe, and the Scarlet or Red and Blue Maccaw yields to none of them in magnificence of plumage. It is also one of the largest species of its family, sometimes measuring as much as three feet from the bill to the tip of the long tail. The principal portion of the plumage of this fine bird is of a bright scarlet colour; the quill-feathers of the wings are of a fine blue; the greater wing-coverts are yellow, tinged with green; the upper and under tail-coverts are blue, the two middle feathers of the tail crimson, and the remainder of the tail-feathers, which gradually decrease in length towards the sides, are partly red and partly blue. The feet are dusky black, the naked skin of the cheeks wrinkled and white, the upper mandible whitish, and the lower one black or dusky.

This splendid species is an inhabitant of the tropical parts of South America; it was formerly abundant in the West Indies, but has now become comparatively rare in most of the islands. It dwells in pairs or in small family parties in the depths of the forests, generally taking up its abode about the palm-trees, upon the fruits of which it to a great extent subsists. The nest of this species is made in a hollow tree, and the bottom is lined with feathers. It has two broods in a year, and lays two eggs at each time; these are about the size of pigeon's eggs. The young birds are pretty easily tamed, although they do not exhibit the docility of many other parrots, and rarely learn to speak even indistinctly. The great beauty of their plumage, however, causes them to be highly valued, notwithstanding the excessive harshness of their cry; and in former times a specimen of this bird was not an unacceptable present even to royalty itself. The natives of South America give the general name of *Ara* or *Araraca* to the Maccaws, a denomination which is evidently in imitation of their note.

THE BLUE AND YELLOW MACCAW (*Macrocercus Ararauna*) is another large and beautiful species, measuring about two feet and a half in length. It has a large black bill; the cheeks are covered with a wrinkled white skin, which bears a few minute black feathers; the whole upper surface is of a rich and beautiful blue colour, and the lower surface of a fine yellow. The throat bears a large black patch. The long and graduated tail is blue above, and yellow beneath. This bird, like the preceding, is an inhabitant of the rich forest regions of tropical South America, where it is especially abundant in marshy places, haunting the palm-trees and feeding upon their fruit. It is very frequently imported into Europe, and appears to be rather more docile than the Scarlet Maccaw.

THE GREAT GREEN MACCAW (*Macrocercus militaris*) has a large and powerful blackish bill, and flesh-coloured cheeks, marked as in the preceding species, with curved lines of minute black or brown feathers. The general colour of the plumage is a fine green, changing to blue on the upper surface; the forehead bears a crimson band; the wings, rump, and upper tail-coverts are bright blue; and the tail-feathers are scarlet. This species is a native of Mexico and the adjoining western parts of South America, where it is exceedingly abundant. In its general habits it resembles the preceding species, but not unfrequently descends upon the plantations, and does much damage, especially to the Indian corn-fields, whenever its supply of food in the forest falls short.

THE SMALL GREEN MACCAW (*Macrocercus severus*), an inhabitant of Guiana and Brazil, is only about the size of a pigeon, measuring seventeen inches in length inclusive of the rather elongated tail. In its characters it seems to present a transition towards the following species, to which the name of *Maccaw-parroquets* has been given. The general colour of this species is green; its bill is black, the naked skin of its cheeks flesh colour; its wings blue, and its tail-feathers tipped and margined with blue; the lower surface of both wings and tail is red. In Brazil and Guiana this little maccaw occurs in great abundance, and descends in numerous flocks upon the coffee plantations, where it does an immense amount of damage by devouring the berries. In captivity it is said to be tolerably docile, but to exhibit the most violent jealousy if its owner should bestow any kindness upon another pet, especially if the latter be a member of the parrot tribe.

THE HYACINTHINE MACCAW (*Macrocercus hyacinthinus*) differs considerably in its appearance from the preceding species, its plumage being of a rich hyacinthine blue, with the quill-feathers of the wings and tail violet-blue, glossed with green. The naked cheeks and the chin are yellow, and the bill and feet are black. This beautiful bird, which is a native of Brazil, does not appear to be so abundant there as some of the other maccaws; at least it is far less frequently imported into Europe. Its length is about twenty-eight inches.

THE YELLOW PARROQUET (*Conurus solstitialis*)—Plate 15, fig. 50—is one of the maccaw parroquets just alluded to, which differ from the true maccaws in the smaller size of the bill, and of the naked space on the cheeks. Like the maccaws, these birds have a long, graduated tail. The Yellow Parroquet is remarkable in this group, as being the only known species of this group of naked-cheeked parrots which is found out of America, it being a native of Western Africa, whence, however, it has been introduced into Brazil, where it is now met with in a wild state. It measures about eleven inches in length, and is of a yellow colour above, and orange beneath; the top of the head is also orange; the wing-quills are margined with green and tipped with blue; the two middle feathers of the tail are green with blue tips, and the rest of the tail-feathers are blue.

THE GUIANA PARROQUET (*Conurus guianensis*) is a native of Guiana, and of other parts of tropical America, including the West Indian islands. It is about twelve inches long, and of a green colour, spotted with red on the cheeks; the lesser under wing-coverts are scarlet, and the greater ones yellow. This bird flies in large flocks, and is described as very injurious to the coffee plantations. In captivity it is said to exhibit a greater aptitude for learning to speak than any other parroquet; and Le Vaillant mentions his having seen a specimen so accomplished as to be able to say the Lord's prayer in Dutch, at the same time folding its feet together in the attitude of devotion.

THE PATAGONIAN PARROT (*Conurus patagonicus*), although not by any means remarkable for the beauty of its plumage, is worthy of notice on account of its advancing so far from the tropics as the southern extremity of the American continent. It is commonly met with in Paraguay, Buenos Ayres, and Chili, inhabiting the mountains at considerable elevations, especially in the summer, but descending towards the autumn nearer to the plains, where it collects in great flocks, and often does much injury to the cultivated grounds. Its general colour is a grayish-green, but the sides of the abdomen are yellow, and its centre bright scarlet. The total length of this bird is about seventeen inches.

THE CAROLINA PARROQUET (*Conurus carolinensis*).—Of the numerous other species of this genus we need only notice the Carolina Parroquet, which is indigenous to the United States of North America, and advances as far as the shores of Lake Michigan. It is fourteen inches in length, and its general colour is a bright silky green; the forehead and cheeks are reddish-orange, and the neck rich yellow. The Carolina Parroquets are found in Mexico, and extend thence through the central valley of North America to the temperate regions; they appear to be permanently resident even in the latter, as Wilson states that he had seen them on the banks of the Ohio in February, flying about in a snow storm. They are sociable birds, flying in large flocks, and exhibiting a great deal of fondness for each other; they may be seen sitting close together, and scratching each other's heads most affectionately. Their favourite food consists of the seeds of various plants, especially those of the cockle-burr (*Xanthium strumarium*), cypress, hackberry, and birch; and it is partly to the abundance of these in the valley of the Mississippi, that Wilson attributes the restriction of the parroquets to that tract of country. They are also exceedingly fond of resorting to the salt springs or *salt licks* which abound in the same region; these they visit, for the purpose of drinking the water, early in the morning, usually about an hour after sunrise. They come in great flocks; and, on alighting on the ground, they give it the appearance of being covered with a carpet of the most vivid green, orange, and yellow tints.

THE ALEXANDRINE PARROQUET (*Palæornis Alexandri*).—Amongst the parroquets of the Old World, which, unlike the preceding, have no naked skin upon the sides of the face, several species inhabiting India and its islands have been formed into a genus called *Palæornis* by Vigors, from some of its members having been evidently the parrots best known to the ancients. The present species is indeed supposed to be the only one known to the Greeks, having been brought from India by the followers of Alexander the Great, from which circumstance it has received its specific name.

The Alexandrine Parroquet, an elegant and favourite species, is fifteen inches in length, including its long, graduated tail; its body is about the size of that of a pigeon. Its general colour is a beautiful bright green, paler beneath; the lesser wing-coverts are purplish-red, and across the back of the neck is a beautiful collar of the same colour, bounded above by a black line, which is continued up on each side to the base of the lower mandible. The bill is bright orange-red. This beautiful bird is abundant in all parts of India, especially in the hilly districts, and also occurs in great numbers in Ceylon. The young are easily tamed, when they become very docile, and may be easily taught to speak a few words.

THE ROSE-RINGED PARROQUET (*Palæornis torquatus*) is still more abundant in India than the preceding species, and is fond of dwelling in the vicinity of human habitations, frequently even breeding in the cavities of buildings. It is about the same size as the Alexandrine Parrroquet, and like it of a fine green colour; it has the throat and a collar black, and the band on the back of the neck is rose colour. It is said to be very destructive to the grain crops in India.

THE MALACCA RING PARROQUET (*Palæornis longicauda*) is another green species, but in this bird the whole of the cheeks and back part of the neck are of a deep rose colour, bounded beneath by a pair of broad moustache-like black streaks, running obliquely backwards from the base of the lower mandible, but not encircling the neck. The primary quills of the wings are bordered with blue; and the two centre feathers of the tail, which in this, as in the other species of the genus are a good deal longer than the rest, are of an azure colour. This handsome bird is a native of Malacca, where it is said by Sir Stamford Raffles to figure in the fables and poems of the natives as a being endowed with a supernatural degree of intelligence. It is also met with in the eastern islands, and is not uncommon in some parts of Borneo.

BARRABAND'S PARROQUET (*Palæornis Barrabandi*) is an Australian species, very nearly allied to the preceding, with which it agrees in size, and in the general green colour of its plumage. It has the forehead, the lower part of the cheeks, and the front of the neck of a rich yellow, bordered beneath by a broad band of red; the primaries are blue.

PENNANT'S PARROQUET (*Platycercus Pennantii*).—The *Platycerci*, which are peculiar to Australia and New Guinea, resemble the preceding species in their elongated tails, but have this part broader and rounded at the tip. The present species is an inhabitant of New South Wales, where it is generally dispersed on the grassy hills and brushes. The general colour of its plumage is a rich deep crimson; but the centre of each feather of the back and scapulars is black, leaving only a rather broad red border; the cheeks are blue; the quill-feathers of the wings are black, bordered with blue externally; the two centre tail-feathers are green with blue margins, and the remainder have their inner webs black, and their outer webs deep blue, for the greater part of their length, the tips of the feathers being a paler blue. Its length is rather more than fifteen inches. It is an abundant and beautiful species, but, from its congregating in large flocks and exhibiting a predilection for the grain crops of the colonists, it undergoes a considerable amount of persecution. Its flesh is said to be very good eating. In its movements this species is active and lively, and it walks upon the ground with great ease; this, indeed, is the case with most of the Australian parroquets.

THE NEW HOLLAND CRESTED PARROQUET (*Calopsitta Novæ Hollandiæ*), a small and elegant species, measuring about twelve inches in total length, is not distinguished by any brilliancy of plumage, its general colour being a pale olive-brown; but it has the whole of the head bright yellow, with a large crimson spot on each cheek, and the crown is adorned with a most graceful crest of long yellow feathers. It is an exceedingly abundant species in some parts of New South Wales, and seeks its food upon the ground, walking with great facility.

THE HORNED PARROQUET (*Nymphicus cornutus*), an inhabitant of New Caledonia, is remarkable for having, springing from the crown of the head, a pair of slender dusky feathers, about an inch and a half long, with crimson tips; its general colour is green, with the head orange-red, and the wings and tail blue-black. The length of this species is about eleven inches.

THE KING PARROQUET (*Aprosmictus scapulatus*), an inhabitant of New South Wales, dwells principally in the brushes, where it generally finds sufficient nourishment in the shape of fruits and seeds, but on the ripening of the Indian corn crops, descends upon these in great flocks, and often occasions a great deal of damage. It has the head, neck, and lower surface scarlet, the back and wings green, the rump and upper tail-coverts deep blue, the tail black, and the bill scarlet.

THE GROUND PARROQUET (*Pezoporus formosus*).—Although the Australian parroquets in general are adapted, by the length of their tarsi and the general structure of their feet, for walking and running with facility upon the ground, where indeed they generally seek the seeds which constitute their principal food, there are some, forming the genera *Pezoporus*, *Nanodes*, and *Melopsittacus*, which appear to be especially organized for a terrestrial existence. Hence they are commonly known as *Ground* and *Grass Parroquets.*

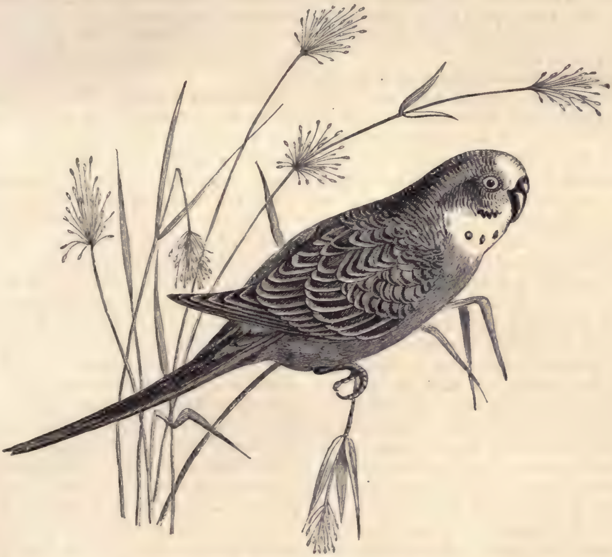
The present species, which is a native of the southern parts of Australia and of Van Diemen's Land, measures rather more than twelve inches in length, including its long pointed tail; its plumage is of a lively green colour above, elegantly spotted with black, whilst the lower surface is variegated with delicate, undulated, transverse bars of green, black, and yellow. At the base of the upper mandible there is an orange-red band. This charming little bird is met with sometimes in sandy barren districts covered with tufts of grass and herbage, sometimes about swampy flats; it passes nearly the whole of its time upon the ground, is never seen to perch, and when flushed takes a short flight, and then alighting again, runs on until it finds a place of safety. It even deposits its eggs on the ground. Mr. Gould says that its flesh is excellent, and much more delicate than that of the snipe.

THE WARBLING GRASS PARROQUET (*Melopsittacus undulatus*), a lovely little species, nearly allied to the preceding, is found exclusively in the vast plains of central Australia, where it occurs in great abundance, flying in flocks of many hundreds, and feeding on the seeds of the grasses with which those deserts are clothed. The length of this species is about seven inches; the colour of its plumage above is olive-green, delicately marked with undulated black or dusky lines; the head and back of the neck are yellowish-green, with a small azure patch upon each cheek; the lower surface is of a delicate yellowish-green colour; the two middle tail-feathers are green at the base, and blue at the extremity, and the remainder are green, tinged with yellow in the middle.

Although there is nothing brilliant in the colouring of this little parroquet, the general effect of its plumage is highly pleasing, and, taken in conjunction with the elegance of its form, renders it one of the most charming members of its tribe. It is also distinguished by the possession of a soft warbling note, a sort of inward song, and for this and its other good qualities, it has of late years received much notice as a cage bird, its manners in confinement being at once lively and affectionate. When two or more are kept together, they are continually engaged in mutual acts expressive of fondness, sometimes billing like pigeons, sometimes scratching gently amongst the plumage of each other's heads, and not unfrequently feeding each other. Hence they have disputed the title of *Love-birds* with a diminutive short-tailed species of parrot, to which that name has long been applied.

During the heat of the day the Grass Parroquets perch in flocks upon the branches of the gum trees, and there shelter themselves from the scorching rays of the sun; they sit so motionless, and their colour assimilates so well with that of the leaves, that, according to Mr. Gould, they can hardly be distinguished. They breed in the holes and hollow spouts of the gum trees in the month of December.

Fig. 121.



The Warbling Grass Parroquet (Melopsittacus undulatus).

THE COLLARED LORY (*Lorius domicella*).—Several small species of this family, which inhabit the Eastern islands and Polynesia, are commonly called Lories. The characters upon which they are separated from the rest of the family consist principally in the comparative weakness of the bill, and the peculiar structure of the tongue, which, instead of terminating in a soft fleshy cushion, is slender, and furnished with elongated papillæ, the latter sometimes even forming a sort of brush at the extremity of the organ. These birds live partly upon pulpy fruits and partly upon the sweet juices of flowers; in collecting the latter the papillæ of the tongue come into use. The largest of these is the Collared Lory, a native of many of the Eastern islands, and also of continental India, which measures eleven inches in length, and is of a bright scarlet, with the wings green, the shoulders and legs blue, and the crown of the head blue-black. A broad yellow band, more or less tinged with red, crosses the upper part of the breast, and the feathers of the short rounded tail are tipped with yellow, within which there is a blackish band. This bird is highly esteemed as a cage bird, not only on account of the beauty of its plumage, but also for its docility and liveliness, and the distinctness with which it learns to utter words and even sentences.

THE PAPUAN LORY (*Charmosyna papua*), one of the most beautiful of these birds, and indeed of the whole family of Parrots, is also of a scarlet colour, but richly variegated with azure-blue, yellow, and green. The crown of the head bears two blue spots, and the whole lower part of the back and the legs are also blue. Each side exhibits two spots of rich yellow, and the wings are green. The tail is long and graduated, and the two centre feathers are much longer than any of the rest; in fact, these feathers alone measure eleven or twelve inches in length, whilst the actual body of the bird is only six inches long. The tail-feathers are all green at the base, and yellow at the extremity. This most beautiful species is a native of New Guinea.

THE BLUE-BELLIED LORIKEET (*Trichoglossus hæmatodes*) is a native of Australia, where it abounds amongst the *Eucalypti*, and feeds daintily upon the nectar of their flowers. It is about thirteen inches in total length, the tail measuring six inches; the head and throat are bluish-purple; the neck bears a collar of yellowish-green, and the rest of the upper plumage is bright grass-green; the front of the neck and breast are bright scarlet, becoming yellow on the sides of the latter; the abdomen is deep purple, and the legs scarlet; the four middle feathers of the tail are entirely green, the rest, from the inner web, yellow, except at the extremity.

THE ORANGE-WINGED LORIKEET (*Trichoglossus pyrrhopterus*) is a smaller species than any of the preceding Lories, measuring only seven inches and a half in length. It has the head of a delicate greenish-blue colour, the neck grayish-white, and the rest of the plumage green, with the exception of the under wing-coverts, which are of a rich orange colour. It is an inhabitant of the Sandwich Islands.

THE GRAY PARROT (*Psittacus erythacus*)—Plate 15, fig. 51.—The common Gray Parrot, being one of the species most frequently kept in this country, must be familiar to all our readers. It is an inhabitant of tropical Africa, where it dwells in the woods, feeds upon seeds and the kernels of fruits, and breeds in the holes of decayed trees, laying about four white eggs. In confinement, and probably also in a state of nature, it generally holds its food in one of its feet, and then bites pieces from it. The strength of its bill enables it readily to break the shells of nuts and almonds, so as to get at their sweet kernels.

As a pet this parrot is a great favourite, and deservedly so, as its docility and intelligence render it very amusing. It learns to speak with greater facility and distinctness than perhaps any other bird, and it is no uncommon thing to hear of parrots which will repeat sentences as long as the Lord's prayer. It also readily picks up any words which are of frequent occurrence in the household, and sometimes brings out its acquisitions in the most amusing manner, frequently repeating certain phrases in the presence of those for whose ears they were not intended. Town parrots also commonly imitate street-noises, and an instance of this related by Mr. Selby may be mentioned, as showing the mischief to which such a habit may unintentionally give rise. A parrot kept upon a quay in a sea-port town had learnt to give in perfection the ejaculatory words commonly used by carters to make their horses back into any required position; one day the bird was amusing himself by repeating this among other things, and did it so naturally that a horse standing close by unattended in a cart, immediately obeyed the command, and probably incited by the reiterated shouts of the parrot, continued his retrograde movement so long that he fell over the quay and was drowned.

We shall not dwell upon any of the numerous anecdotes commonly related of this bird, but will conclude our short description with Le Vaillant's account of one which lived to the patriarchal age of ninety-three. In his best days this parrot had been distinguished for his powers of conversation, and he was so remarkably docile that he would perform many little acts when ordered to do so, such as fetching his master's slippers, calling the servants, and the like. When he reached the ripe age of sixty, he began to lose his memory, and would confuse and jumble together different fragments of his former learning; from this time his infirmities went on increasing, until in his last days he became perfectly decrepid, and was only kept alive by being fed at intervals with biscuit soaked in Madeira.

LE VAILLANT'S PARROT (*Psittacus Le Vaillantii*), another African species, is migratory in its habits, passing to the region of the tropics during the rainy season, and advancing in the summer as far south as the region of the Cape of Good Hope. It is about the same size as the Gray Parrot, and the general colour of its plumage is olive-green in various shades; the rump, belly, and tail-coverts are bright green; the bend of the wing is marked with bright orange-red; the wings themselves are brownish-black, with a greenish gloss, and with green borders to the coverts and scapulars; the tail-feathers are of the same colour as those of the wings.

THE GREEN PARROT (*Chrysotis amazonicus*), which is even a more common bird in this country than the Gray Parrot, is an inhabitant of the forests of tropical America, where it occurs, with other allied species, in immense numbers. It is a little larger than the Gray Parrot, and its plumage is of a fine grass-green colour, with the edges of each feather dusky; the forehead is bluish, and the head and throat yellowish; the spurious wing is red, and the wings and tail more or less variegated with green, black, red, and yellow. This species appears to be liable to considerable variation. It is tolerably docile, and learns to speak pretty readily, but is generally inferior in both these respects to the African Gray Parrot. This species and its allies are especially abundant in the rich forests along the course of the great rivers of South America. They not unfrequently descend upon plantations situated in the vicinity of their haunts, and do great mischief.

THE FESTIVE PARROT (*Chrysotis festivus*) is another of these South American species. It is still larger than the common Green Parrot, measuring fifteen or sixteen inches in length; its colour is green, with the hinder part of the crown of the head blue, a streak of red running from each nostril to the eye, the lower part of the back, rump, and upper tail-coverts scarlet, and the quill-feathers of the wings deep blue.

THE LOVE-BIRD (*Agapornis Swinderiana*).—Several charming diminutive species of this family nearly allied to the preceding, are commonly known as *Love-birds*, from their being usually seen sitting as closely as possible to each other, and occasionally billing in the most affectionate manner. In captivity they are generally kept in pairs, when they exhibit the greatest apparent fondness for each other, and it is a common belief, probably well founded, that if one should die, the other will pine away with grief at the loss of its companion.

The present species, which is a native of Southern Africa, is one of the smallest of its tribe, measuring only five inches in length. Its colour is a delicate but lively green; round the back of the neck there is a black collar, and beneath this a yellow band, which encircles the neck, and expands considerably on the breast; the short tail has the two middle feathers green, and the remainder scarlet at the base and green at the tip, the two colours being separated by a black band.

THE BONNETED PSITTACULE (*Psittacula pileata*)—Plate 15, fig. 52—another of the small species of short-tailed parrots, is an inhabitant of South America, where it appears to be a bird of passage. It is rather more than eight inches in length, and of a green colour, with the head black and the back of the neck orange-coloured; the orbit is white and is continued into a point before and behind; the wings are edged with blue, and the tips of all the tail-feathers, except the two middle ones, are blue.

THE GREAT SULPHUR-CRESTED COCKATOO—(*Cacatua galerita*).—The Cockatoos, like the preceding Parrots, have a broad and even tail, but they are readily distinguished from those birds by the presence of a large crest, which the birds are able to elevate or depress at pleasure. Their name is an imitation of the peculiar cry of some of the species, which closely resembles the syllables *Kakatoé*. They are all inhabitants of the islands of the Eastern archipelago and Australia; the latter is the native place of the present species, one of the finest of the whole.

The Great Sulphur-crested Cockatoo measures two feet in length, and is of a pure white colour, with only a slight yellowish tinge about the sides of the tail and the wing coverts; the head bears a long pointed crest of a fine sulphur-yellow colour, the tip of which is a little curved upwards. This bird is not unfrequently brought to this country, and will learn to perform various tricks and to speak with some distinctness.

THE SMALL SULPHUR-CRESTED COCKATOO (*Cacatua sulphurea*) resembles the preceding species in almost every particular except its size, its length being only about fifteen inches. It has a sulphur-yellow spot below each eye. The Moluccas and other islands of the Indian archipelago are the habitation of this bird, which is perhaps more frequently brought to Europe than the preceding species. In captivity it displays to the fullest extent a habit common to all the Cockatoos, namely, that of uttering a most discordant screaming noise; it is, however, tolerably docile, and will learn to speak a few words.

THE BROAD-CRESTED COCKATOO (*Cacatua cristata*), another white species, is about seventeen inches in length, and has the head and breast slightly tinged with rose colour; its crest, which is very large, is composed of feathers which are white above, and rich scarlet beneath, producing together a delicate rose-tint. This species inhabits Australia.

LEADBEATER'S COCKATOO (*Cacatua Leadbeateri*), a very handsome species, also a native of Australia, is a little larger than the Small Sulphur-crested Cockatoo, and of a white colour, tinged with crimson, and with the lower surface of the wings deep crimson. The head is adorned with a crest of long, pointed feathers, capable of being erected so as to form a perfect fan; they are deep crimson at the base, then yellow, then crimson again, and their apical half is white.

THE LONG-NOSED COCKATOO (*Licmetis tenuirostris*)—Plate 13, fig. 53.—This bird is distinguished from the ordinary Cockatoos by the small size of its crest, and the great length of the upper mandible, which is produced far beyond the lower one. It is an inhabitant of South Australia, where it is seen in great flocks, and spends much of its time upon the ground, searching for bulbous roots which its curiously-formed bill enables it to dig up with facility. It also attacks the corn fields occasionally and does much damage. The larvæ of insects are also a favourite food with it, and in searching for these under the bark of trees, it is said to make use of its projecting upper mandible as a sort of lever to prize off the bark.

THE GOLIAH COCKATOO (*Microglossum aterrimum*)—Plate 15, fig. 54—an inhabitant of New Guinea and the neighbouring islands, one of the largest of known parrots, is distinguished by several remarkable characters. Its cheeks are covered with a naked skin, as is the case in the maccaws, which this bird further resembles in the immense size and strength of its bill; but within these powerful jaws there is a small and slender tongue very different from that of any other parrot, or indeed of any other bird. Le Vaillant compares it to the trunk of an elephant, and gives the bird the name of *Ara à trompe* or "Trunked maccaw." This organ is of a cylindrical form, capable of being considerably protruded from the mouth, and terminated by a cleft horny extremity. According to Le Vaillant the bird breaks up his food by means of his beak, and then, putting out his tongue, takes up a portion of the food in the cleft at the extremity of that organ; the tongue is then drawn back within the bill and passed along the palate where there is a small projection, which, coming in contact with the morsel of food carried by the tongue, detaches it and causes it to fall into the throat.

The Goliah Cockatoo is entirely black, but the living bird has a greenish-gray tint from the quantity of whitish powdery matter which is scattered over the feathers, and which occurs in more or less abundance in most of the cockatoos. The tail is very short. The enormous bill is black; the naked wrinkled skin of the cheeks is red; and the crown of the head is furnished with an erectile crest of long, slender, gray feathers.

THE BANKSIAN COCKATOO (*Calyptorhynchus Banksii*).—Besides the white cockatoos, several other species of this group are found in various parts of Australia, in which the general colour of the plumage is black in the males, and blackish-brown spotted with white in the females. The crest in these birds is smaller than in the white cockatoos, but they are generally provided with long and ample tails. In the Banksian Cockatoo, which is a very large and magnificent species, the whole of the plumage is deep black in the male, with a very broad red band crossing all the tail-feathers except the two middle ones; in the female this red band is broken up by numerous irregular black marks. These birds are generally seen in small parties of about six or eight in number, except during the breeding season, when they live in pairs. They deposit their eggs in the hollow dead branches of the gum-trees. Their food consists partly of fruits and seeds, and partly of insects, which they seek with great avidity under the bark of trees.

THE FUNEREAL COCKATOO (*Calyptorhynchus funereus*) is another species, about the same size as the preceding, from which it is distinguished by the orange-yellow colour of the band across the tail. This bird is called the *Wy-la* by the natives, in imitation of its mournful cry.

THE PHILLIP ISLAND PARROT (*Nestor productus*).—Besides the preceding and many other fine birds of this family, the Australasian region nourishes several curious species to which we must briefly allude. One of these is the Phillip Island Parrot, which is believed to be now peculiar to the small island whose name it bears, and even there it is getting very scarce. Its plumage is brown above; the head and back of the neck are gray; the cheeks, throat, and chest, are yellow, the former tinged with red; the rump, belly, and under tail-coverts are deep red, and the tail-feathers are banded with orange and brown. The structure of the tongue is peculiar; it is furnished with a small horny scoop on the under side of the tip, which is supposed to be of service to the bird in feeding upon the nectar of certain flowers of which it is very fond. The upper mandible is much prolonged.

THE NEW ZEALAND NESTOR (*Nestor hypopolius*) is very similar to the preceding, but has a somewhat shorter upper mandible, and differs in some particulars of its colouring. It feeds upon fruits, berries, and roots, and is frequently caught and tamed by the natives, when it learns to speak with great facility.

PECQUET'S DASYPTILE (*Dasyptilus Pecquetii*) an inhabitant of New South Wales, is another singular species, having the basal portion of the bill much straighter than in the other parrots, and the upper mandible somewhat suddenly hooked, so that the form of the bill resembles that prevailing amongst the rapacious birds. The cere, also, is greatly developed, as in the birds of prey, and the nostrils are placed close to its margin. The cheeks, the top of the head, and the upper part of the neck, are wholly or partially naked; the cheeks bearing only scattered hairs, and the head being sparingly clothed with setaceous feathers. The general colour of the plumage, which is of a rigid texture, is black, but the greater wing-coverts, the outer webs of the secondary quills, the upper tail-coverts, and the whole lower surface below the breast, are of a fine crimson. It is a large species, measuring fully twenty inches in length.

THE KAKAPO (*Strigops habroptilus*) is perhaps the most singular of all the Psittacidæ, from the remarkable resemblance which it presents to an owl in its general aspect and in the nature of its plumage. It is an inhabitant of New Zealand and of the neighbouring islands, and is strictly nocturnal in its habits, passing the day concealed in holes under the roots of trees, and coming forth at night to seek the roots which constitute its favourite food. The habits of this bird are strictly terrestrial, its wings being very short, and its power of flight small; on the ground, however, it runs with great facility, and forms tracks, in the places which it frequents, of about a foot broad, and so exactly like ordinary footpaths, that when first seen they led to the suspicion that natives were residing in the vicinity. The cry of this bird is a hoarse croak, and is compared by the natives to that of a species of owl inhabiting the same country. They also say that great numbers of Kakapos assemble together and pass the winter in large caves, and that, at the time of their assembling and dispersion, they exert their voices to such an extent as to produce a noise that is perfectly deafening. They breed in the holes which they ordinarily inhabit, lining the bottom with a little fern, and lay two or three eggs. The Kakapo is a solitary and not very abundant bird; and since the introduction of cats into New Zealand its numbers have decreased so greatly, that there is some reason to fear that it will speedily become almost extinct.

It is a moderately large species, and is covered with a thick soft plumage, resembling in its texture that of the owls and other nocturnal birds; and, like these, it has a perfectly noiseless flight. The general colour of the plumage is a grayish-green, darker on the upper surface, where it is mottled with spots and zigzag lines of black; the lower surface is black, marked with delicate, undulated, dusky lines. The eyes are of considerable size and surrounded below by a facial disc of slender feathers, which partially conceal the base of the bill, exactly as in the owls. With this singular bird we take leave of the Parrot family.

FAMILY III.—PICIDÆ.

The birds of this family, which are commonly known as Woodpeckers, have a rather long straight bill, of which the tip is commonly obtuse or truncated, and the sides marked with a longitudinal ridge. Their feet, as already described (see page 372, and fig. 120), are organized for running upon the bark of trees, being furnished with long, spreading toes, armed at the extremity with strong, sharp, curved claws, which enable them readily to seize any small inequality of the bark; whilst the tarsus is so placed as to form a sort of sole which gives the bird great firmness in its ordinary position. Both the tarsi and toes are clothed above with scaly plates. The tail also is of service to most of the Woodpeckers in their climbing; it is rather short, but composed of stiff feathers, which are pointed at the extremity, and generally more or less worn away at this part.

These birds, especially the more typical species (for some, as we shall see, differ from the rest in their habits), reside in the woods and forests of both hemispheres, principally in the warmer regions, and run with great activity and in every direction upon the trunks and branches of trees, searching for the insects which constitute the greater part of their food. With this object in view they are constantly tapping the bark with their bills, in order to discover soft or rotten places which may be inhabited by bark-feeding insects; on meeting with a suspicious spot (and they are probably seldom mistaken), they immediately dig vigorously into the bark and seize the insect or larva. The capture of the smaller insects at any rate is effected by means of the tongue, which, with its appurtenances, exhibits a beautiful modification to adapt it for this purpose. The hyoid bone, which supports the tongue, has its posterior branches enormously elongated and continued in the form of slender springs, which, passing under the skull, are carried up round the back and over the top of the head, until their extremities reach to the right nostril. Each of these elongated bony springs is accompanied throughout by a slender muscle, by the contraction of which its bow is shortened, and the tongue is pushed out. Its retractation is effected by means of another pair of muscles. The tip of the tongue itself is horny, and furnished with several small barbs directed backwards; this arrangement is supposed to facilitate the capture of larvæ, which, being pierced by the tip of the tongue, may be prevented by the barbs from escaping, notwithstanding their struggles. But for the capture of the smaller insects, which abound both under the bark and among the crevices of its surface, the tongue is endued with a glutinous matter, which is secreted by a pair of large glands situated in the throat, and communicating with the mouth by long ducts; these open into the mouth at the point where the two branches of the lower mandible unite together, and consequently close to the front of the mouth, so that the glutinous coating of the tongue will be renewed every time that organ is drawn back within the bill. Besides insects, the Woodpeckers feed upon fruits and seeds, and some of them are accused of devouring, or even carrying off, fruits from the orchards to a considerable extent.

The Woodpeckers roost and breed in the holes of trees, which they are able to enlarge to suit their purposes by means of their strong and sharp bills. The eggs are deposited upon the chips and debris at the bottom of the hole; they are variable in number, but, in almost all known cases, are of a smooth and shining texture, and of a pure white colour.

THE GREAT BLACK WOODPECKER (*Picus martius*) —Plate 16, fig. 57—a rare bird in Britain, is not uncommon in some parts of Europe, especially in the pine forests of the Alps. It is also found in Germany and France, and extends thence over the northern parts of Europe through Russia into Siberia. The length of this bird is about sixteen inches, and its plumage is of a deep black colour, with the top of the head slightly crested and bright blood-red. Its note resembles a loud, hoarse laugh. Its food consists chiefly of insects, which it captures upon or under the bark of trees as already described; it will also feed on nuts, seeds, and berries. It lays three eggs of a pure white colour.

THE GREAT SPOTTED WOODPECKER (*Dryobates major*) is not an uncommon bird in some parts of this country, especially in the southern and midland counties; in the more northern districts a few specimens appear late in autumn, and are supposed to migrate from Norway and Sweden. The species is found in all parts of Europe. It is an inhabitant of woods, parks, and gardens; but its shyness prevents it from being frequently seen, as, on the approach of any intruder on its haunts, it will creep round the trunk of the tree on which it is sitting, or conceal itself behind a branch. It rarely alights on the ground, but occasionally visits old posts or rails and decayed pollard trees, probably finding an abundance of insect food in such situations. The bird is said to adopt a singular and ingenious contrivance for obtaining insects, which is described in the following words in one of the editions of Pennant's British Zoology:—"By putting the point of its bill into a crack of the limb of a large tree, and making a quick tremulous motion with its head, it occasions a sound as if the tree was splitting, which alarms the insects and induces them to quit their recesses; this it repeats every minute or two for half an hour, and will then fly off to another tree, generally fixing itself near the top for the same purpose. The noise may be distinctly heard for half a mile." The eggs of this bird are deposited in the hole of a tree, and are as many as five in number.

The Great Spotted Woodpecker is between nine and ten inches in length, and is of a black colour above, with the forehead and the sides of the head dirty white, the back of the head bright scarlet, and a spot on each side of the neck, the scapulars and numerous spots on the wings white; the throat is dirty white, bounded by a black stripe, and the remainder of the lower surface is also dingy white, except the vent and lower tail-coverts, which are red. The two middle tail-feathers are entirely black; the two next on each side black, tipped with white; and the rest banded with black and white.

THE LESSER SPOTTED WOODPECKER (*Dryobates minor*), another British species, is not uncommon in the southern and midland counties, but becomes rare towards the north. It is distributed over most parts of Europe, and extends its range through Siberia. Its length is a little less than six inches, and its bill is shorter in proportion than in the preceding species. It has the crown of the head scarlet, the forehead, cheeks, and sides of the neck dingy white, and the upper surface black, barred with white on the back; the wings are grayish-black, with white bars; the four middle tail-feathers are black, the next on each side tipped with white, and the remainder barred with white and black. The lower surface of the body is grayish-white, with black longitudinal streaks. This bird is generally seen searching for insects upon the bark of trees, and often amongst the moss-covered branches of fruit-trees in orchards. It also occasionally descends to the ground and seeks its food amongst the grass. Two other nearly allied species (*D. medius* and *leuconotus*) are found commonly on the continent of Europe.

THE THREE-TOED WOODPECKER (*Picoides tridactylus*)—Plate 16, fig. 58.—This bird, which is an inhabitant of the northern parts of both hemispheres, is distinguished from the preceding species, and indeed from nearly all the other birds of this family, by its possessing only three toes, the inner or true hinder toe being entirely deficient. It measures two inches in length, and has the forehead, the back of the head, and a streak behind each eye black; the crown of the head golden yellow; the wings black, banded with white; the back and lower surface white, with numerous transverse black spots; and the tail black, with the two outer feathers on each side banded with white.

THE IVORY-BILLED WOODPECKER (*Campephilus principalis*), one of the largest species of this family, is a native of the southern United States. It measures about twenty inches in length, and is of a black colour, with a greenish gloss; the top of the head is adorned with a crest of a fine red colour; a white stripe starting from beneath each eye, passes down the side of the neck, and along the back nearly to the rump; the five inner primaries are furnished with a gradually increasing white tip, and the secondaries are wholly white. The bill, which is perfectly white and like ivory, is extremely powerful and elegantly fluted; it measures nearly an inch in breadth at its base. With this formidable organ the Ivory-billed Woodpecker is able to break off large quantities of the bark of trees in searching for the insects on which he feeds, and even to dig a hole into the solid wood to furnish himself with a lodging. His note is described as loud and trumpet-like; but when captured, he emits a reiterated cry exactly resembling that of a child. The head and bill of this bird are said by Wilson to have been in his time in great esteem among the Indians as a charm.

THE GREEN WOODPECKER (*Gecinus viridis*).—This species is the most abundant of the British Woodpeckers, and is found in most of the wooded districts both of England and Scotland; it also occurs in almost all parts of Europe. It is about thirteen inches in length, and is of a dark yellowish-green colour above, and ashy-green below; the crown and back of the head are scarlet; a black moustache-like streak, with a scarlet patch along its middle, runs backwards from the base of the lower mandible on each side; the rump, and upper tail-coverts, are sulphur-yellow; and the quill-feathers, both of the wings and tail, are grayish-black, more or less distinctly spotted or banded with white.

In searching the bark of trees for insects, the Green Woodpecker usually starts from near the bottom of the trunk, and thence advances upwards, tapping on the bark to dislodge the insects concealed in its crevices, and digging into any decayed or hollow parts, to capture the concealed larvæ. On reaching the top of the tree, it does not descend it again, but flies off, usually to another tree. One portion of the food of this bird consists of ants, and their larvæ and pupæ, in pursuit of which it frequently visits the ground; and Mr. Yarrell states, that he had seldom seen a newly killed specimen, which had not some earth adhering to the base of the bill, indicating that it had been plundering an ant-hill.

Like the other Woodpeckers, this species breeds in the holes of trees, and in excavating or enlarging these, it is said to carry away the chips to a distance in order to prevent their betraying the position of the nest. The eggs are from five to seven in number. The note of this bird is loud, and is compared to a laugh; it is said to be most frequently heard before rain, and hence in some places, the bird has received the name of the Rain-bird. There is a considerable number of species nearly allied to this, inhabiting most parts of both hemispheres.

THE YELLOW-BACKED WOODPECKER (*Brachypternus aurantius*), an inhabitant of India and Ceylon, is about eight inches in length, and of a black colour above, with the top of the head spotted with white; the crest, the middle of the back, and part of the wing-coverts orange; and the wings brown, mottled with white. The lower surface is brownish-white, with brown markings. This bird, with some allied Indian species, is remarkable for the structure of its feet, the inner hind toe being of very small size, and provided only with a weak claw. It is common in the vicinity of Calcutta, where it breeds in the holes of trees. In Ceylon it frequents the Palmyra topes, excavating large holes in the trunks of the male trees, which are softer than those of the females.

THE TIGA WOODPECKER (*Chrysonotus Tiga*).—In this, and several allied Indian species, the feet have only three toes, the inner hind toe, which was rudimentary in the last mentioned species, being here entirely deficient. In other respects, these birds agree closely with the Yellow-backed Woodpecker.

THE RED-HEADED WOODPECKER (*Melanerpes erythrocephalus*).—This bird, which may be taken as the type of a subordinate group of Woodpeckers peculiar to America, is an inhabitant of the United States and Canada, performing a southward migration from its most northern haunts, at the approach of winter. Its length is between nine and ten inches; its head and neck are deep scarlet; the greater part of the upper surface is black, with a bluish gloss; but the rump, and lower part of the back, and the secondary feathers are white, as is also the entire lower surface.

This bird, like the rest of his family, frequents woods and orchards, and feeds principally upon the insects which he dislodges from their retreats in or under the bark. As he is an abundant bird, and incessantly engaged in the destruction of these secret foes to vegetation, the services which he renders to man in preserving trees are very great; nevertheless, as he has a taste for fruit, and a remarkable discrimination in selecting the best sorts, he has been regarded, in common with most of his relatives, as a nuisance, and in former times the legislatures of some of the states offered a premium of twopence per head for the destruction of Woodpeckers. Ripe cherries are great favourites with him, as are also pears and apples; if disturbed when regaling himself upon the latter, "he seizes a capital one by striking his open bill deep into it, and bears it off to the woods." He also attacks the Indian corn when in its milky state. Like the other members of this family, the Red-headed Woodpecker deposits its eggs in a hole of the trunk, or some large limb of a tree. The eggs, which are six in number, are white, with a few reddish spots. The black snake frequently invades the nest of the woodpecker, and devours its eggs and young, in spite of the clamour of the parent birds. After feasting in this way, the reptile will frequently coil himself up in the place of his victims, and sometimes remain there for several days, causing the most intense alarm to the unlucky schoolboy, who, on attempting to plunder the nest, finds that another robber has been before him.

THE COLLARED WOODPECKER (*Melanopicus torquatus*), another inhabitant of the United States, is nearly a foot in length; its plumage is black, with a greenish gloss above; the forehead, cheeks, and chin are deep red; round the neck there is a white collar, which spreads over the breast; the abdomen is deep scarlet, and the vent black. In its general habits it agrees with the preceding species.

THE RED-BELLIED WOODPECKER (*Centurus carolinus*) is found in all parts of the United States and even in Canada; it is also said to be a native of some of the West Indian islands. It has the forehead yellow, the upper part of the head and neck golden red, the cheeks and throat buff, and the lower surface yellowish-ash, tinged with blood-red on the belly. The back is black, with transverse white lines; the wings and tail black, beautifully barred with white; and the rump and tail coverts are white. The length of this bird is about ten inches. In its habits it resembles the preceding species, running about on the trunks and branches of trees, and making a rattling noise upon the dead limbs so loud as to be heard at a distance of half a mile. It sometimes feeds with avidity upon the Indian corn. According to Wilson, its voice is hoarser than that of the other woodpeckers; he says that its usual note is "chow," and adds that it reminded him of the barking of a little lapdog. At the breeding season it digs a hole usually in the lower surface of the oblique decaying limb of a tree, in which the female deposits five pure white eggs. The young when nearly full-grown, but not yet able to fly, creep out of the nest and climb to the higher branches, where they are fed for some days by their parents, but often pay the penalty of their impatience to see the world by being snapped up by hawks.

THE DOMINICAN WOODPECKER (*Leuconerpes dominicanus*), an inhabitant ot South America, has its plumage generally white; the back of the neck, a streak running backward from each eye, the anterior half of the back and the wings black; the tail is also black, with brown bands; the back of the head and the belly are yellow. Its total length is about twelve inches. This bird is said by Azara to frequent trees and walls, but rarely to run upon them like the preceding woodpeckers. It perches frequently in the manner of ordinary birds, and feeds upon wasps, and other insects, and upon fruits.

THE GOLDEN-WINGED WOODPECKER (*Colaptes auratus*) is an example of a peculiar group, in which the bill is almost destitute of ridges. Members of this group are found in both hemispheres; the present species is a native of North America, in nearly all parts of which it is to be found. Its colour above is a dark brown, with transverse black streaks; the upper part of the head is gray, the cheeks are cinnamon-brown, and on the back of the head is a bright red crescent-shaped spot; the throat and chin are fawn colour, bounded on each side by a black streak, running from the base of the bill; on the breast there is a broad, deep black crescent, and the belly is yellowish-white, with round black spots. The lower surface of the wings and tail, and the shafts of all the quills are of a beautiful golden-yellow colour, whence the name of the species; the rump and tail-coverts are white, and the tail black. The length of this bird is about twelve inches.

The food of the Golden-winged Woodpecker seems to consist principally of ants and their larvæ, in pursuit of which he visits the broken and decayed stumps of trees and even the ground. But, although thus partially terrestrial in its habits, this bird frequents trees like the other members of its family, and climbs over their trunks and branches with great ease. It also feeds freely upon fruits, and is very partial to Indian corn, especially in the state known to the American farmers as *roasting ears*. Its nest is made as usual in a hole in the trunk or branch of a tree, and this is sometimes dug by the birds themselves out of the solid wood. The eggs are white, and six in number.

THE MINUTE PICULET (*Picumnus minutus*).—Under the name of Piculets we may distinguish a small group of very diminutive species, which inhabit the tropical regions of both hemispheres; they differ from the true woodpeckers principally in the structure of the tail, which is not used in supporting the bird, and has the tips of its feathers rounded. The present, with several nearly allied species, inhabits the forests of tropical America, where it appears to be pretty widely dispersed. It measures only three inches and a quarter in length, and is of a brown colour above, with numerous white spots, and with the forehead and part of the crown of the head bright red; the lower surface is yellowish-brown, streaked with a darker tint. In its general habits this little bird resembles its larger relatives already described, creeping about in search of insects upon the trunks and branches of trees, and breeding in holes.

TEMMINCK'S PICULET (*Sasia abnormis*).—In this, and one or two other species occurring in India, the feet are furnished with only three toes, two in front and one behind, as in *Picoides* and *Chrysonotus*. The present species, which is a native of Malacca and the neighbouring islands, is probably the most diminutive member of its family, measuring only three inches in length; three quarters of an inch less than the diminutive golden-crested wren, the smallest of British birds. It is of a green colour above, with the forehead yellow, and the cheeks reddish-brown; the eyes are surrounded by a naked skin of a bright rose colour; the rump is yellowish-orange, the tail black, and the lower surface light cinnamon colour, with a yellowish gloss on the abdomen.

THE WRYNECK (*Yunx torquilla*)—Plate 17, fig. 59.—This bird, which is a summer visitor to England, is widely distributed over the northern parts of the eastern hemisphere, extending its range at least as far eastward as India. In this country it arrives in April, and leaves us again about the end of August; and as these are also pretty nearly the times of arrival and departure of the cuckoo, this bird is known in some places under the name of the cuckoo's mate. Its name of Wryneck has been given to it on account of its habit of twisting its head into various positions, especially while feeding. Although the colouring of this bird cannot boast of any brilliancy, its ground colour being yellowish-gray above and white beneath, variously spotted, mottled and banded with brown and black, yet, from the elegance of its form, and the beauty of its markings, it cannot but be regarded as a handsome bird.

The food of the Wryneck consists principally of ants and their larvæ and pupæ, in search of which it visits the ground in the vicinity of the nests of those insects; it also captures insects of various kinds whilst running upon the trunks and branches of trees in the manner of the true Woodpeckers. In all cases the insects are captured by means of the extensible, worm-like tongue, which is endued with a viscid secretion to which the insects adhere; this organ is darted out and retracted with such extraordinary rapidity that the pale-coloured larva or pupa of an ant adhering to it, being more conspicuous than the tongue itself, seems almost as if moving towards the mouth by attraction. The Wryneck breeds in the holes of trees, laying its eggs upon the rotten wood at the bottom of the cavity. The eggs are sometimes nine or ten in number, and are of a pure white colour.

THE CAYENNE BARBET (*Capito cayanensis*).—Mr.

Gray and some other ornithologists place in this family several species of birds which appear to have much in common with the Puff birds and Barbacous which we have placed among the Kingfishers. They are distinguished, however, by having two toes in front and two behind, although the inner hind toe is short. They inhabit the depths of the forests, where they reside in solitude and seek their insect food. They nestle in the holes of trees. The present species, which inhabits Guiana, is about seven inches in length, and is black above, and yellowish-white beneath, with the forehead and chin red.

THE GREEN INDIAN BARBET (*Megalaima viridis*), a species allied to the preceding, is of a green colour, with the head and neck grayish-brown, the wing primaries brown, and the orbits white. It is six inches and a half in length. This species dwells in the forests of India, chiefly on the mountains, where it is seen perching on the highest branches of trees.

THE CEYLON BARBET (*Megalaima zeilanica*) is green, with the head and neck pale-brown, and the cheeks yellow; its bill is red. This bird, which is about an inch shorter than the preceding, is an abundant species in Ceylon, where it breeds in the holes of trees, laying three or four pure white eggs. It feeds upon fruits and berries of all kinds, and probably also upon insects and small birds, as Mr. Layard found that a specimen confined in an aviary destroyed and swallowed whole the little *Amadinæ* which were placed with it. When confined in a small cage this individual set to work to dig his way through the wood, and hammered upon it vigorously in the manner of a woodpecker.

FAMILY IV.—CUCULIDÆ.

This last family of the Scansorial birds includes the common Cuckoo of this country, together with a considerable number of other species, which agree with it more or less in structure and habits. These birds, with but few exceptions, have a slender compressed bill, of which the upper mandible is arched along the ridge, and furnished with a notch on each margin near the tip. The gape is generally very wide, extending back nearly to the eyes, almost as in the Fissirostral division of the Passeres, with which it must be confessed that the Cuckoos have some affinity. The nostrils are placed at the base of the upper mandible in a membranous groove; the tail is long and ample, with the tips of its feathers rounded; the tarsi are rather short, and the toes long, but unequal in length.

The birds of this family occur in both hemispheres, and, indeed, in most parts of the world. They are most abundant in warm climates, and those which are met with in cold or temperate countries are generally summer birds of passage. They all feed principally upon insects. In their breeding they exhibit a remarkable dissimilarity; for, whilst many species build a nest and bring up their young in the manner of birds in general, others, amongst which is our own Cuckoo, make over all the labour of incubation and rearing the young to other birds, in whose nests they deposit their eggs.

THE COMMON CUCKOO (*Cuculus canorus*)—Plate 17, fig. 60.—This bird, whose note, at any rate, is well known in this country, although many are unacquainted with him by sight, is about the size of a small pigeon, but, from the elongation of his tail, he measures nearly a foot in length. The whole of the upper parts of the body are of a bluish-ash colour, and this tint also extends over the throat and chest; the abdomen is white, with numerous blackish-brown transverse streaks; and the tail is black, with white spots at the extremity, and along the shafts and margins of the feathers. It is an inhabitant of the greater part of the eastern hemisphere, occurring as a summer visitor in Europe, and the other northern countries which it frequents, and retiring for the winter into the warmer regions of Africa and Southern Asia. In this country it arrives in April, and takes its departure again in August; during the intervening period its curious note, closely resembling the word *Cuckoo*, may be constantly heard about woods, orchards, and hedgerows. In the present day most people hear this note with pleasure, from its association with the commencement of fine weather, but formerly it was frequently regarded as a sound of evil omen, and no doubt some relics of this superstitious feeling may still linger in agricultural districts.

The food of the Cuckoo consists of insects and their larvæ, and amongst the latter he seems to prefer the large hairy caterpillars of the tiger moth, commonly known to country people under the name of woolly bears. The hairs with which these caterpillars are clothed, remain, with the legs of beetles and other indigestible portions of the food, in the stomach, whence they are no doubt ejected in the same way as the feathers and bones of small birds by the birds of prey. A considerable portion of the hairs, however, seem to adhere to the walls of the stomach, which in this way are frequently covered with a hairy coat. The Cuckoo is usually seen perched upon the branch of a tree or bush, the shortness of its tarsi rendering motion on the ground awkward to it, although it frequently descends amongst the herbage at the base of the hedges to search for its favourite caterpillars. Its flight is tolerably swift, and it glides with easy motion from tree to tree.

We have now to speak of that singular and mysterious instinct which prompts the Cuckoo and many other species of its family to deposit their eggs in the nests of other birds, thus saving themselves all the trouble of building a nest, hatching their eggs, and bringing up their young. Although it is impossible to say for what purpose this curious instinct has been implanted in these birds, it is, nevertheless, completely in accordance with their peculiar structure and mode of reproduction. They produce their eggs only at intervals of several days, and as their residence in our temperate climate is but short, the young could hardly be all brought to maturity by their own parents in time to take their departure with them. The egg of the Cuckoo is of very small size in comparison with the bird; its weight does not exceed that of the skylark's egg, although the comparative size of the two birds is as four to one. Hence, the egg of the parasite is readily introduced into the nest of its intended foster parent, and the latter is not alarmed by the presence in its habitation of an egg so enormous as to be positively inconvenient. This is of some consequence, as the birds whose nests are selected by the Cuckoo for the reception of its eggs are all much less than itself. They are tolerably numerous, but the favourite species in this country seem to be the hedge-sparrow, the pied wagtail, and the meadow pipit.

The Cuckoo's egg is hatched in a shorter period than those of its foster parent, and thus the young Cuckoo commonly makes its appearance before many of the eggs of the latter are hatched. Its first business, after coming into the world, is to get rid as speedily as possible of all its companions, whether hatched or not, in order to secure to itself the exclusive attention of its foster parents, for as it has to grow rapidly to maturity, it requires to be supplied with a much larger quantity of food than would fall to its share if the insects and worms collected by the old birds had to be divided amongst a nestful of hungry claimants. With this exceedingly selfish object in view, the young Cuckoo begins operations by gently insinuating his rump under the body of one of the young birds, which he then, with the assistance of his wings, contrives to hoist upon his back, which is provided with a peculiar depression for the express purpose of enabling the unfortunate little victim to ride there in safety. With his load properly poised, the young Cuckoo goes backwards until he reaches the edge of the nest, when, with a sudden jerk, he throws it off to perish. The other young birds soon follow, and he then betakes himself to the unhatched eggs, which are disposed of in the same way. The instinct of getting rid of young birds in this way is found to last in the young Cuckoo for several days after he is hatched, but, singularly enough, he will allow an egg to remain if put into the nest when he is nine or ten days old. The young Cuckoo, left by this means the sole possessor of the nest, thrives rapidly upon the abundant nourishment, the enjoyment of which he has secured to himself, and in the course of about three weeks he is able to leave the nest, although he still makes constant demands upon his foster parents; and, indeed, there is reason to believe that the cry of the young Cuckoo will induce almost any bird in his neighbourhood to bring him food. This applies also to the other parasitic species of this family, and to the equally parasitic cowpen-bird of the United States. Young thrushes, only just able to take care of themselves, have been known, in captivity, to bring food to young cuckoos, and the late Bishop of Norwich mentions an instance in which a cuckoo administered a most severe punishment to a young thrush who ventured to devour a worm, instead of dutifully carrying it up to his greedy companion. The young Cuckoos do not leave this country till September, although the old birds, as already stated, depart at the end of July or beginning of August; young birds have even been known to remain in Cornwall till October.

THE AUSTRALIAN CUCKOO (*Cuculus optatus*).—This bird is so similar to our European species, that at first sight it might be regarded as the same bird. It differs, however, in some minor particulars, such as the greater breadth and distinctness of the black bands on the breast, the light fawn-colour of the abdomen, and the smaller size of the claws. It has only been met with in the northern parts of Australia, and nothing is known of its habits.

THE UNADORNED CUCKOO (*Cuculus inornatus*), the common species in Southern Australia, is a summer visitor to Van Diemen's Land, and also appears to be partially migratory on the continent of Australia. It is about the same size as the preceding species, and of a brownish-gray colour, darker, and tinged with olive on the upper surface; the feathers of the long tail are marked with triangular spots of white along their margins. The call of this species is very different from that of our common Cuckoo, being a ringing whistle, forming a succession of running notes, of which the last and highest are several times repeated. Its food consists chiefly of caterpillars, beetles, and Phasmidæ, in pursuit of which amongst the branches it displays great agility. Like the European Cuckoo, this bird is parasitic in its habits, depositing its eggs in the nests of numerous species of small birds, and the young Cuckoo, after leaving the nest, may be seen sitting on the branch of a tree and receiving supplies of food from other birds, sometimes belonging to more than one species.

THE BRONZE CUCKOO (*Chrysococcyx lucidus*) appears to be the most widely dispersed of the Australian Cuckoos, being met with in all parts of the continent of Australia, and also in Van Diemen's Land. It is a small species, measuring only five inches and a half in length, but the tail is much shorter than in the ordinary Cuckoos. The male has the whole upper surface of a rich bronze colour, with the wing primaries brown, and the lower surface white, with numerous transverse bronzed stripes interrupted in the middle; in the female the bronzed tint of the upper surface is a mere wash upon the brown, and the transverse bars of the lower surface are faint, and of a brown colour.

This bird is a summer visitor to Van Diemen's Land, and partially migratory in New South Wales. It feeds upon insects of various kinds, and its note is described by Mr. Gould as a mournful whistle. Like the preceding it lays its eggs in the nests of other birds, usually selecting a domed nest with a very small entrance.

THE INDIAN BLACK CUCKOO (*Eudynamys orientalis*), an inhabitant of India and the eastern parts of Asia, including its islands, is about twelve inches in length, and of a black colour, with a rich blue gloss on the upper surface. It is found about trees, and is a noisy bird, constantly uttering a loud note, compared to the syllables *koyo*. The food of this species consists of fruits, and it deposits its eggs in the nests of the Indian crows (*Corvus splendens* and *C. culminans*).

FLINDERS' CUCKOO (*Eudynamys Flindersii*), an inhabitant of the eastern and northern parts of Australia, is about fourteen inches in length, of which the ample tail makes up nearly half. The male is entirely of a deep glossy greenish-black, with the irides red, and the bill yellowish-olive; the female is brown above, with numerous buff or whitish spots and bars, and buffy-white below, spotted and barred with blackish-brown. The top of the head, and a streak running from the base of the bill along each cheek, are greenish-black. The habits of this bird are unknown.

THE GREAT SPOTTED CUCKOO (*Coccystes glandarius*), a native of Northern and Western Africa, measures about fifteen inches in length, but of this the tail constitutes nearly half. This bird is of a grayish-black colour above, with the head dark ash-colour, and adorned with a crest of long feathers, and with nearly all the feathers of the wings tipped with white; the tail-coverts are long and pointed, and tipped with white, as are also the graduated tail-feathers, of which the two middle ones are brown, and the rest blackish; the whole of the lower surface is white. Individuals of this species migrate in the summer into the southern countries of Europe; they are most abundant in Italy and Spain. A single specimen has also been taken in Ireland.

LE VAILLANT'S CUCKOO (*Coccystes serratus*), another African species, is known at the Cape of Good Hope as the *Niewe Jaars Voogel*, or New-Year's-bird, from a supposition that it only makes its appearance at New-Year's-day.

THE PIED CRESTED-CUCKOO (*Coccystes melanoleucos*), which is generally distributed in India, and especially abundant in Bengal and Ceylon, is black above, and white beneath, with a white spot upon each wing, and the tips of the tail-feathers white. It is about eleven inches in length. This bird frequents the tops of trees, and feeds principally upon caterpillars, and other soft insects. It deposits its eggs in the nests of a species of *Malacocercus*. Mr. E. L. Layard observed a pair of the latter hovering with great solicitude over a bush, and on his approaching, they flew off, as if wounded, to lead him from the spot; on examining the bush, he found that the object of their anxious cares was a young Cuckoo of the present species, and on capturing it, the old birds flew about him uttering cries of distress.

THE ANI (*Crotophaga Ani*).—Several species of this family, inhabitants of South America, and known under the native name of *Ani*, are distinguished by the form of the bill, which is much compressed, with the ridge of the upper mandible greatly curved, and dilated at the base into a thin sharp plate or crest. The common Ani is about fourteen inches in length, and of a black colour, with a violet gloss; its tail is very long and graduated. It inhabits the savannahs and the banks of streams in the West Indian islands, and in Brazil and Paraguay, living in small societies in the forests even during the breeding season, when several males and females work together in the formation of a common nest; after the completion of which the females perform the business of incubation and rearing the young in common. The food of this bird and its allies consists principally of insects and their larvæ; it is fond of searching the skins of cattle for the parasites adhering to them, and may even be seen suspended from the tail of a cow, carefully examining the tuft of hairs at its extremity for any insects that may harbour there. Flies and other winged insects are captured by it on the wing. It also feeds partially upon fruits and berries.

THE COUROLL (*Leptosomus afer*) is an inhabitant of Southern Africa and of Madagascar, in the latter of which countries it is called the *Vourong-drion;* its name of *Couroll* has been given to it by the French ornithologists to express its apparent combination of the characters of the Cuckoos and the Rollers. It is eighteen or nineteen inches in length, of which about half is made up by the long tail; its colour is a bronzed green above, with the primary quills greenish-black; the back of the head bears a tuft of bronzed-brown feathers; a black streak runs from the angle of the mouth to the eye; the neck and the upper part of the breast are of a delicate slaty-gray, and the rest of the lower surface nearly white. The female is said to be reddish-brown, spotted with brown, above, and light red, variegated with black, beneath. This bird resides in the forests, and lives principally upon fruits, but also devours large insects, such as locusts, mantides, and cicadæ. It hatches its own eggs, and brings up its own young.

THE CHANNEL-BILL (*Scythrops Novæ Hollandiæ*).—New South Wales is the native country of this remarkable bird, which, having been placed amongst the Hornbills by some naturalists, and with the Toucans by others, has at last found a permanent resting-place in the family of the Cuckoos. It is a large species, measuring about twenty inches in length, and is furnished with a long and powerful bill, of which the upper mandible is strongly channeled on each side a little below the ridge, and has its margins pretty strongly denticulated or festooned for some distance from the point. The plumage is gray, that of the back, wings, and tail being darkest, and having each feather, including the central tail-feathers, tipped with brownish-black; the rest of the tail-feathers bear a broad black band near the apex, the tip itself being white; the abdomen and lower surface of the wings are buffy-white, with indistinct grayish-brown transverse bars. The eyes are surrounded by a scarlet skin, which descends to the nostrils at the base of the bill, and the bill itself is of a pale-brown colour.

The Channel-bill is a migratory bird, arriving in New South Wales in October and departing in January; its winter residence is unknown. The food of this bird consists of insects, especially the large phasmidæ and beetles, which its large and strong bill enables it to destroy and devour with facility. Its habits in the breeding season are quite unknown.

THE YELLOW-BILLED AMERICAN CUCKOO (*Coccyzus americanus*).—This bird is a summer visitor to the United States of North America, where it is commonly known as the *Cow-bird*, from its note resembling the word *cow*. It passes the winter in the West Indies, and migrates in the spring as far north as Canada. A few specimens have been killed in this country, although it would appear almost impossible for the birds to cross the Atlantic. The Yellow-billed Cuckoo is brownish-gray above, exhibiting greenish, reddish, and bluish tints, according to the direction of the light; the lower surface is of a silvery whiteness; the two middle tail-feathers are light brownish-orange, and the remainder black, tipped with white. The bill is brownish-black, with the base of the upper mandible and the whole of the lower one, except the extreme tip, bright yellow.

The food of this bird consists principally of caterpillars, but it also eats fruits of different kinds, and is accused of sucking the eggs of other birds. It builds a flat, thin nest, composed of a few twigs and fragments of herbage, upon the horizontal branch of a tree, and lays four or five eggs. Upon these the female sits with an assiduity which forms a remarkable contrast to the desertion of their offspring by the typical Cuckoos; she will remain upon her nest until the hand is almost in contact with her, and when compelled to quit it by the approach of danger, will flutter along the ground as if maimed in the wing, in order to entice away the intruder.

THE PHEASANT CUCKOO (*Centropus phasianus*), a large and remarkably fine species inhabiting New South Wales, is readily distinguished by the great length of the claw belonging to the true (or inner) hind toe. From this character the name of *Lark-heeled Cuckoos* has been conferred upon the present species and its allies. It measures about thirty inches in length, of which fully half is occupied by the broad and ample tail. Its general colour is a rich brown, paler beneath, streaked on the body, and barred on the wings and tail, with buff, each streak or bar being narrowly edged with black. This bird inhabits swampy places among the brushes, where it runs through the herbage with great facility. When disturbed, it flies up to the low branch of some tree, and thence ascends by leaping from branch to branch to the top of the tree, whence it flies off to another. Unlike some of the preceding species, the Pheasant Cuckoo takes the trouble of hatching and rearing its own young, building a large nest of dried grasses, usually in the midst of a tuft of grass. The nest is domed, and furnished with two openings, through one of which the head, and through the other the tail of the female protrudes whilst she is engaged in the work of incubation.

THE SENEGAL LARK-HEELED CUCKOO (*Centropus senegalensis*), which appears to inhabit nearly the whole of Africa, is not more than sixteen inches in length, and has the head, back of the neck, and upper part of the back, black; the rest of the back and the wings cinnamon-red; the rump and tail feathers blackish, more or less streaked transversely with fine buff lines; the lower part of the body is buffy white. As in the preceding species, the shafts of nearly all the feathers are thick, stiff, and brilliant, giving a peculiar character to the plumage. This bird lives in pairs in the forest, and feeds upon locusts and other large insects. It breeds in the holes of trees, and the male and female assist each other in the task of incubation. The note of the male is described by Le Vaillant as resembling the words *coura-coura-how-coura-how*.

THE RED-WINGED CUCKOO (*Centropus rufipennis*), a common species in India and in the eastern islands, is known to the European residents in India as the "Crow Pheasant," from its presenting a certain resemblance both in appearance and manners to those two birds. It resides both in wooded and cultivated grounds, and in the open jungles, and feeds principally on the ground, walking along somewhat pompously, with its ample tail widely spread, and picking up not only large insects, but also centipedes, scorpions, and even small lizards and snakes. Colonel Sykes found in one of these birds a snake eight inches, and a lizard thirteen inches in length. The head of the latter was in the stomach and partly digested, whilst the body was still in the œsophagus. The note of this species is described as a monotonous cry of *hoot-hoot-hoot*, or *hoop-hoop-hoop*. The young bird is said by Mr. Blyth to be almost constantly repeating a curious hoarse sound "like a person choking, which," he says, "is not pleasant to hear." The nest, which is of very large size, and domed, is placed in a thick bush or tree. It has a single aperture in the side.

THE TACCO (*Saurothera vetula*).—Several American species of this family, called *Ground Cuckoos* by Mr. Gray, are distinguished by their long straight bill, which is curved only at the point, and denticulated along the margin, their long tarsi and their short toes. They are thus organized for dwelling more upon the ground than most of the other Cuculidæ. The present species, which is the best known, is an inhabitant of the West Indies, and especially of the island of Jamaica, where it is tolerably abundant in the woods, and is known as the *Rain-bird*, from its uttering its peculiar cry before rain. This bird is about fifteen inches in length, including its long wedge-shaped tail. It is of a brown colour above, and pale yellowish-brown beneath, with the chin and throat nearly white; all the tail-feathers, except the two middle ones, are tipped with white. Its food consists of caterpillars and other large insects, and of small lizards, snakes, and other animals which it is able to overcome. In pursuit of its prey, it runs with facility not only on the ground, but also on the trunks and branches of trees, the latter being the situation in which it most commonly meets with the small lizards on which it preys, and it passes with the most astonishing facility through the thickest bushes. Its common cry resembles the word *tacco;* but when on the wing, or alarmed at any object, it pronounces the syllables *cra-cra-cra*, or *qua-qua-qua*, in a tone so much resembling a sudden burst of laughter, that it is known in some places by the name of the *Laugher*. This species builds a nest at the foot of a tree, composing it of dry roots, moss, and leaves, and lays four or five eggs.

SPARRMANN'S HONEY GUIDE (*Indicator Sparmanni*) is of a rusty-gray colour above, having the wings brown, with a yellow spot at the bend. It is about six inches in length, and inhabits the southern parts of Africa, where, with some allied species, it is noted for its fondness for feeding upon bees, and especially upon the contents of their combs. In search of these dainties, the Honey Guides seek out the nests of the wild bees, which are generally built in holes of trees, and endeavour to force their way in; to protect them from the stings of the industrious insects whose premises they thus invade, they are furnished with a covering of stiff and hard feathers, and with a skin so dense, that Le Vaillant asserts that it gave him some trouble to pierce it with a pin. Nevertheless, they are occasionally destroyed during their burglarious proceedings by the bees, which then cover up the body with a waxen vault to prevent its decomposition rendering it a nuisance in the nest. By their cries when haunting the vicinity of a wild hive, and probably engaged in capturing the bees as they issue from, or return to their home, these birds often lead the Hottentots and others to the place; indeed, the older naturalists believed that when the birds found it impossible to get access to the combs by their own exertions, they would set off in search of human aid, and guide their allies to the hive by flying before them from bush to bush. The Hottentots are said always to leave a portion of comb for the Honey Guides when they have been led by them to the discovery of a hive. A peculiar mammal, the Ratel, which is as partial to honey and the other contents of the hive as the Honey Guides themselves, also avails himself of the instinct of these birds, and is often conducted to a rich banquet by their cries. The Honey Guides fly heavily, and only for short distances, but they run upon the trunks and branches of trees with great agility in the manner of the Woodpeckers, to which Mr. Blyth considers them as more nearly allied than to the Cuckoos. Their mode of breeding has long been a matter of dispute—some ornithologists asserting that they deposit their eggs in holes of trees, and others that they form a pensile nest; but, from the observations of M. Verreaux, it would appear that they have the parasitic habits of the common Cuckoo, introducing their eggs sometimes into the nests of Woodpeckers, and sometimes into those of Orioles, which would account for the discrepancy in the statements above alluded to. The species are principally found in Africa, and indeed in the southern parts of that continent, but one or two occur in the forests of India, and in the island of Borneo.

ORDER IV.—COLUMBÆ.

THE Order of the Columbæ or Pigeons stands as it were in an intermediate position between the Passerine birds and the Gallinæ, between the two sections of Insessores and Autophagæ, into which, as already stated (p. 235), the class of birds has been divided. With the former they agree in their nidification and in the helplessness of their young, which remain in the nest for a considerable time, and require to be carefully tended and fed by the parent birds; whilst they approach the latter to a considerable extent in their structure. Indeed, by some ornithologists the Columbæ are amalgamated with the gallinaceous birds to form a single order. There is, however, one important peculiarity which seems to distinguish the Pigeons from all birds; the walls of that dilatation of the œsophagus which usually goes by the name of the *crop*, are furnished with a number of glands, from which during the breeding season a milky juice exudes; this mingles with the food in the crop, soaks into it and softens it, so that, as the young birds are fed with substances regurgitated from the crops of their parents, they may be regarded as partially nourished by a secretion produced by the latter, just as the young Mammals are supported upon their mother's milk.

The principal distinctive character of the Columbæ is furnished by the structure of the bill. The upper mandible consists of a horny apical portion, which is often of considerable length and strength, but its base is formed by a convex cartilaginous plate, in the anterior portion of which the nostrils are situated. The skin covering the cartilaginous portion of the bill is of a soft texture, very different from that of the rest of the bill; it is sometimes smooth and clothed with a sort of scurf, but in other cases it is warty, or even developed into a fleshy wattle. This is especially the case in some domesticated varieties of the pigeon.

The Columbæ are provided with short tarsi and moderately long toes, all scutellated. The toes are four in number, three in front and one behind; the anterior toes are not united by a membrane at their base; the hinder toe is placed in the same plane as the anterior toes, and the whole sole of the foot is formed by soft papillated pads, which are usually a good deal wider than the scutellated upper portion of the toes. The wings, which are generally long and pointed, contain ten primary quills, and the tail usually consists of twelve feathers, although in some cases there are sixteen. An important distinctive character of the birds of this order as compared with the Gallinæ, is to be found in the fact that their feathers are destitute of the plumules or accessory plumes (p. 232), which are greatly developed in the gallinaceous birds.

The form of the wings in the Pigeons is sufficient to indicate that they are birds of rapid and powerful flight, and many of them are remarkable for the speed with which they traverse the air, especially when engaged in those migrations which some species perform. Most of them are arboreal in their habits, and nestle in the holes of trees; others frequent rocks; but all perch with great facility, although they generally seek their food upon the ground, and walk or run with considerable ease. They are also remarkable in their mode of drinking, in which they differ from all other known birds. The general practice of birds in drinking is, as is well-known, to take up a small portion of water in the bill, and then, by raising the head, to allow it to flow down into the throat; the Pigeons, on the contrary, dip their bills into the water and hold them there until they have quenched their thirst.

In Mr. Gray's arrangement the Pigeons form only a single family, that of the Columbidæ; and as the birds all exhibit a very close resemblance to each other, we may follow his example in this respect, merely separating the species into certain subordinate groups which appear to be indicated by peculiar characters. These birds are inhabitants of the warmer and temperate regions of the earth, but they are found in most abundance in hot climates, where also their plumage attains a brilliancy of which that of our native species gives us no idea.

FAMILY I.—COLUMBIDÆ.

PIGEONS.

The section of the *True Pigeons*, to which our British species of this group belong, may be regarded as the most typical of the order. The birds of this section have a rather small and slender bill, the base of which distinctly exhibits the soft and somewhat inflated skin described as characteristic of the Pigeons in general; the nostrils are in the form of longitudinal slits near the front of this basal inflation; and the tarsi and toes are of moderate length. The first species to which we shall refer is—

THE STOCK-DOVE (*Columba Œnas*)—Plate 17, fig. 61. This is rather a rare and local British species, found only in the southern and midland counties of England. In the south of Europe it is abundant, but visits the central and northern parts of the continent only in the summer, and many individuals appear to migrate in the autumn into Africa even from Italy and the islands of the Mediterranean. It inhabits woods and breeds in the holes of trees, especially in those which occur so commonly in the heads of pollard-oaks and willows. In those districts, however, in which trees are scarce, such as some parts of Norfolk and Suffolk, the Stock-dove makes its nest in the rabbit burrows, or in the midst of a thick furze bush. The eggs are two in number and pure white. The voice of the Stock-dove is a grunting or rumbling note, very different from the musical and plaintive coo which we are accustomed to associate with the idea of a dove, and far from agreeable. Its food consists of young leaves, berries, and seeds of various kinds, according to the season; and during the winter it associates in flocks with the Ring-doves, which it resembles in its mode of life. The length of the Stock-dove is between thirteen and fourteen inches.

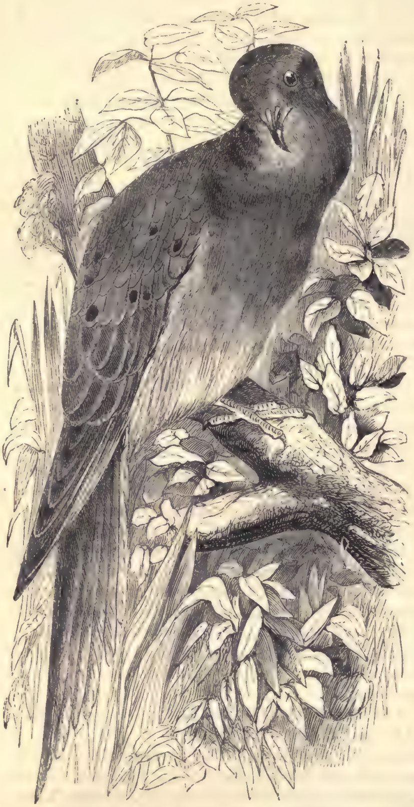
THE RING-DOVE (*Columba Palumbus*), also called the CUSHAT and the WOOD-PIGEON, is a larger species than the preceding, some specimens measuring seventeen inches in length. It is of a bluish-gray colour, with the wing-primaries lead-gray, narrowly margined externally with white, and with a portion of the wing-coverts white; the neck and breast are purple-red, and the feathers of the sides of the neck are largely tipped with white, in such a manner as to represent portions of several white rings encircling the neck; the tail-feathers exhibit three shades of gray, the palest in the middle, with the exception of the two central ones, which are bluish-gray, with the tips lead colour. The irides are yellow, the bill reddish-orange, and the feet red.

Like the preceding species, this, which is the largest European pigeon, inhabits the woods both of this country and of the continent of Europe; it is most abundant in the south, and is only a summer visitor to the most northern countries, such as Norway and Sweden. It is particularly fond of thick plantations of firs, in which it delights to build, and here its tender cooing notes may be heard throughout the spring and summer. The nest is built upon the branches of trees, and is composed of a few sticks laid across one another. The eggs are two in number and white.

THE ROCK-DOVE (*Columba livia*), the parent stock of our domestic pigeons, is a very widely distributed species, occurring, apparently in a wild state, in all parts of the Old World. The wild birds are rather less than twelve inches in length, and are of a bluish-gray colour, with the lower parts of the back pure white, two black bands across the wings, and the throat exhibiting beautiful glossy purple and green tints; the lower surface is pearl-gray, as are also the tail-feathers, except at the tips, where they are lead colour. Our dove-cote pigeons approach very closely in all these characters to the original wild stock; but the varieties which have been produced in what are called the *fancy breeds* of pigeons are almost innumerable, and many of them differ so much from each other, and from the common parents of the whole, that it would seem at first sight almost impossible that they should all spring from the same species. Almost every part of the birds takes part in these remarkable changes; the bill and feet, the character of the plumage, are changed to a very considerable extent; the colour varies from pure white to deep black, and exhibits almost every possible mixture of the intervening tints, and in one variety even the number of feathers in the tail is greatly increased. The Tumblers, so called from their curious habit of turning over backwards in the air, present the closest resemblance in form to the common pigeon, but in them the head, bill, and feet are small; these characters occur also in several other breeds, of which we may mention the *Jacobins*, which have the feathers of the sides of the head and neck curled, so as to form a sort of ruff; and the *Fantails*, in which we find the tail-feathers increased to thirty-six, or three times their natural number, forming a broad arched tail. The *Carriers*, which are large birds, with the bill elongated and the feet large, are distinguished by the great development of the naked skin at the base of the bill, which forms a large warty wattle. This character is also presented, although to a less extent, by the nearly-allied breeds called *Horsemen* and *Dragoons*. These latter birds, but especially the Carriers, are remarkable for the degree in which they possess the power, common indeed to all the pigeons, but in a less degree, of finding their way home from long distances—a faculty which has caused them to be employed from time immemorial in the rapid and secret conveyance of intelligence.

THE PASSENGER PIGEON (*Ectopistes migratorius*), which is an inhabitant of the United States, is remarkable on account of the prodigious numbers in which it associates together, and the extraordinary migrations performed by these vast flocks. These migrations appear to be undertaken in search of food, especially beech mast, of which these pigeons are very fond; and when they have consumed the whole supply of this in any given spot in the forest, they betake themselves to some other district, perhaps at a distance of many miles, but still residing in the place where they first took up their abode, to which they regularly return every evening after their foraging expeditions. Wilson mentions one of these roosting-places in Kentucky, which was said to extend through the woods for a distance of forty miles, with a breadth of several miles. In these spots the pigeons also breed; they produce only one young one at a time, but breed several times in the year, and as the nests are very numerous and close together, they are plundered to a vast extent of their nearly full-grown inmates by the inhabitants of the country for many miles round the breeding-place. The pigeons are also shot and knocked down in vast numbers as they return to their roosting-place in the evening, and they afford an abundant supply of food to both beasts and birds of prey. Audubon's account of a nocturnal *battue* of these birds, at which he assisted, is most animated and interesting, but too long for insertion here.

Fig. 122.



The Passenger Pigeon (Ectopistes migratorius).

The Passenger Pigeon—fig. 122—has long, pointed wings, and a large, wedge-shaped tail. Its colour above is bluish-gray; the sides of the neck are reddish chestnut, with brilliant golden-green, and purple tints; the wings are lead-gray, and the coverts exhibit a few black spots; the chin is bluish-gray, and the remainder of the lower surface chestnut, becoming paler on the belly. and leaving the vent and lower tail-coverts white; the two middle tail-feathers are blackish brown, and the remainder white, more or less tinged with gray and lead colour, especially towards the base. In its general characters it much resembles our common Turtle Dove. Its length is from sixteen to seventeen inches.

THE TURTLE DOVE (*Turtur auritus*), an abundant species in Europe, Asia, and Africa, is a summer visitor to this country, in the southern parts of which it is not uncommon. It is of a light brown colour above, and still paler beneath, with the belly and vent white; the top of the head is of a bluish-ash colour; on each side of the neck there are four rows of black feathers, tipped with white, which form four oblique bars; the wing-coverts are dark brown, with broad reddish-brown margins; the two central tail-feathers are dark brown, tipped with white; the remainder are paler, and the outermost on each side has its external web white. The Turtle Dove builds a slight nest in a bush or tree, usually about eight or ten feet from the ground. In this the female lays two eggs; and in this country the birds produce only one brood in the season, but in warmer climates they are described as laying twice. The voice of this species is a tender and mournful cooing.

THE COLLARED TURTLE DOVE (*Turtur risorius*), a native of the warm regions of Africa and Asia, is a smaller species than the preceding, measuring only about ten inches in length. It is of a very pale and delicate grayish-brown colour, with a sort of black collar surrounding the back of the neck. This bird has been domesticated, or at least bred in captivity, from time immemorial, especially in the East.

THE GRACEFUL GROUND-DOVE (*Geopelia cuneata*), the Turtle Dove of the colonists of Swan River, is an inhabitant of most parts of Australia, where it is a general favourite. It is a very elegant little bird, measuring only eight inches in length, including a long tail; its general colour is a cinnamon-brown above, and a delicate gray beneath; the latter is also the colour of the head and neck. The wing-coverts and scapulars are marked with numerous white spots encircled with black lines, and the outer graduated tail-feathers are white except at the base. The eye is red, and surrounded by a rather broad circle of naked red skin. This elegant little pigeon lives principally on the ground, searching for the seeds which constitute its food. Its note is said by Mr. Gilbert to resemble the distant crowing of a cock.

THE MAGNIFICENT FRUIT-PIGEON (*Carpophaga magnifica*)—Plate 17, fig. 63—one of the most splendid of its tribe, is found abundantly in the south-eastern parts of Australia, especially in the brushes about the Macquarrie and Clarence rivers. It measures about sixteen inches in length, and has the head and neck of a delicate pale gray colour, and the whole of the upper surface and wings rich golden-green, with bright yellow patches upon the greater wing-coverts and tertiaries, forming an irregular band across the wing; the tail is bronzed green; from the chin a deep purple line passes down the centre of the throat, and joins a large patch of the same rich colour, which occupies the breast and belly, and is followed behind by a band of orange-yellow covering the lower part of the flanks, the vent and the thighs, whilst the under tail-coverts are greenish-yellow. It is a shy bird, but has a hoarse, loud, and monotonous note, by which its presence is often betrayed. Its food consists chiefly of wild figs and the fruits of palms, in search of which it passes nearly the whole of its time on trees.

TREE PIGEONS.

The birds to which the name of Tree Pigeons has been given, are distinguished from the preceding by their generally short stout bill, in which the ridge of both mandibles is nearly equally arched, and by their very short tarsi, which are usually clothed with feathers for a greater or less distance below the heel. The inner front toe is also shorter than the outer one. The shortness of the tarsi in these birds indicates that they are less adapted than the preceding pigeons for walking upon the ground, and in their habits they are pre-eminently arboreal, passing nearly their whole time amongst the branches of trees, and feeding principally upon the fruits which they find in such situations. They are confined to the warmer parts of the eastern hemisphere, and the majority of the species are inhabitants of Southern Asia, with its islands, and Australia. A few species are also met with in Africa.

SWAINSON'S FRUIT-PIGEON (*Ptilinopus Swainsonii*), a native of the Clarence river district of Australia, is a beautiful little bird, measuring about seven inches and a half in length. It is of a shining green colour above, with the whole top of the head crimson, surrounded by a yellow ring; the feathers of the wings are more or less distinctly margined with yellow, and the tertiaries are deep blue towards the extremity; the tail-feathers are broadly tipped with yellow; the neck is grayish, and the breast green, each feather of the latter part being forked at the extremity, and marked with a silvery spot, giving a singular aspect to this portion of the plumage; the flanks are green, but the centre of the abdomen is orange-red, with a reddish-lilac crescent-shaped band separating it from the green of the breast, and the under tail-coverts are orange-yellow.

THE AROMATIC PIGEON (*Treron aromatica*) is a native of India, Java, and some other neighbouring islands, where it resides principally upon the banyan trees. It is a shy bird, to which the concealment afforded by the dense foliage of the banyans is most welcome; and as the fruit of these trees affords it a constant and abundant supply of food, it is rarely under the necessity of quitting its shelter. During the greater part of the year considerable flocks of these birds live together; but during the breeding season they pair, and build a slight nest of twigs, upon which the female deposits two white eggs.

The Aromatic Pigeon measures between ten and eleven inches in length, and has the whole lower surface, except the chin and throat, which are yellow, of a yellowish-green colour; the crown of the head is grayish; the neck is green; the back and lesser wing-coverts are purplish-red; the greater wing-coverts and secondaries black, with bright yellow margins, and the primaries are black. The lower part of the back, the rump, and the two middle tail-feathers are green; the rest of the tail-feathers are bluish-gray, with a dark central band. Many other species of Tree Pigeons are met with in the Eastern Islands. The WHITE-BOOTED PIGEON (*Treron Sieboldii*), represented on Plate 18, fig. 65, is a native of Japan.

THE WAALIA PIGEON (*Treron abyssinica*)—Plate 18, fig. 69—a native of Abyssinia, and of several other parts of Africa, flies in large flocks, and reposes during the heat of the day amongst the foliage of trees. It is said by Bruce to be particularly fond of a species of ash, upon the seeds of which it feeds. At the commencement of the rainy season it migrates from Abyssinia towards the south and south-west. The Waalia Pigeons are very fat, and good eating; but they are regarded as unclean by the Abyssinians, who will not even touch their bodies.

GROUND PIGEONS.

In this group the bill is of the same form as in the true Pigeons, which these birds resemble in their general characters; but they have the tarsi much elongated, and considerably stouter than in the preceding groups, and their toes greatly resemble those of the gallinaceous birds. The wings of the Ground Pigeons are also short and rounded, indicating far less power of flight than is possessed by the Pigeons generally; and, in fact, both in their structure and mode of life they may be regarded as forming a transition from the true Pigeons to the true Gallinæ. These birds are found almost exclusively in the warmer parts of the world. Most of them are inhabitants of the eastern hemisphere, especially the Indian islands and Australia.

THE CROWNED PIGEON (*Goura coronata*)—Plate 18, fig. 66. This bird, which is the largest living species of its order, is an inhabitant of many of the islands of the Eastern archipelago, in some of which it is tolerably abundant. It feeds upon seeds, which it picks up from the ground, and also upon berries; it builds its nest upon the branch of a tree, and lays only two eggs. The young are fed by their parents with food regurgitated from the crop.

The length of this fine Pigeon is from twenty-eight to thirty inches. The general colour of its plumage is a pale bluish-gray, but the feathers of the back, the scapulars, and lesser wing-coverts, are black at the base, and purplish-brown at the apex, and the greater wing-coverts are also purplish-brown, with a broad white band across their middle. The quill feathers of the wings and tail are gray. The most striking character presented by the bird consists in an elegant and ample crest of delicate decomposed plumes with which the head is adorned. This is of the same pale bluish-gray colour as the plumage of the head and lower parts.

THE NICOBAR PIGEON (*Calœnas nicobarica*) is found not only in the island of Nicobar, but also on the continent of Asia, and in several other islands, including the Moluccas and New Ireland. It measures about fifteen inches in length, and is remarkable for the splendour of its plumage, which is of a rich metallic green colour, and exhibits the most brilliant golden, coppery, and purplish tints, according to the direction in which the light strikes it. The feathers of the back of the neck are much elongated, and form a brilliant mantle, which falls over the back and wings.

THE TAMBOURINE GROUND-DOVE (*Peristera tympanistria*), a native of Southern Africa, has received its name from the resemblance of the cooing of the male, when heard at some distance, to the sound of a tambourine. It is of a brown colour above, and nearly white beneath; its forehead is also white, and the greater wing-coverts exhibit three or four spots of greenish-black. Its length is about nine inches.

THE JAMAICA GROUND-DOVE (*Peristera jamaicensis*), which, with several other nearly allied species, is generally distributed in South America and the West Indian islands, is about twelve inches in length, and is of a pale brown colour, with an orange tinge above, and white, with a reddish tint beneath. The sides and back of the neck are wine red, with lilac and golden-green reflections. This bird inhabits the woods, where it runs upon the ground with great swiftness, and roosts in thick bushes.

THE PASSERINE GROUND-DOVE (*Chamæpelia passerina*), a member of a genus which is peculiar to America, in almost all parts of which the species are distributed, is found not only in the West Indies, but also in the southern states of North America, where, however, it is a bird of passage. It is a very small species, measuring little more than six inches in length; its colour is a pale ashy-brown above, and pale reddish-brown beneath. These birds frequent the open fields and plantations, where they fly in small flocks, and feed upon rice and other seeds.

THE BRONZE-WINGED PIGEON (*Phaps chalcoptera*), an inhabitant of almost all parts of Australia, is about the size of a small pigeon, and is of a grayish-brown colour, with a large spot of brilliant coppery bronze on each feather of the wing-coverts; the forehead is buff, or buffy white, and there is a large white streak under each eye. Unlike the preceding species, this bird possesses great powers of flight, an endowment which is necessary to it in the drier parts of Australia, to enable it to visit the scattered supplies of water. It, nevertheless, feeds entirely on the ground, and often frequents the stubble-fields in great abundance, when it may be easily shot. The flesh is said to be excellent.

THE PARTRIDGE BRONZE-WING (*Geophaps scripta*), a native of Southern Australia, is likewise celebrated by Mr. Gould for its gastronomic qualities. It is about the size, and has very much of the appearance and gait of a partridge; its general colour is light brown, but the chin and sides of the head are adorned with snow-white patches, separated by spaces of deep black; the flanks are white, and several of the greater wing-coverts exhibit spots of metallic greenish-purple. This bird is commonly seen in small parties or coveys, and is so tame that the bullock-drivers not unfrequently kill it with their whips. It feeds on the ground upon the seeds of grasses and other plants, and also lays its two white eggs upon the bare ground. When disturbed it flies off exactly in the same manner as a partridge, but generally directs its course to the nearest tree, when, alighting upon a horizontal limb, and placing itself in the direction of the axis of the branch, it will sit so closely that it is with difficulty distinguished or driven off. Several nearly allied species are met with in different parts of Australia.

THE CRESTED PIGEON (*Ocyphaps lophotes*), which is also related to the preceding species, is a most elegant little dove which inhabits the interior of the Australian continent. It is about ten inches long; the head, neck, and lower surface are of a delicate gray colour; the back is light olive-brown; the lesser wing-coverts are light-brown, with a transverse black bar on each feather, and the greater wing-coverts, shining bronzed green, margined with white; the quills are dark-brown, with white edges. But the distinguishing characteristic of this pigeon consists in an elegant black crest, much resembling that of our native lapwing, which springs from the back of the head, measures about two inches and a half in length, and gradually tapers to a point.

The Crested Pigeon is generally met with in swampy districts; it possesses great powers of flight, and usually congregates in considerable flocks, especially when visiting the water to drink.

DIDUNCULINE PIGEONS.

This group includes only a single species—

THE DIDUNCULUS (*Didunculus strigirostris*), which, however, presents the most singular combination of characters, and is further remarkable as being the nearest living ally of the extinct Dodo. In this curious bird the bill is large and strong; the upper mandible is convex, and strongly hooked at the tip, whilst the lower mandible is abruptly truncated at the apex, and armed on each side with three strong teeth. The basal portion of the sides of the upper mandible is covered with a membrane, in which the elongated and oblique nostrils are pierced; the wings are tolerably long; the tarsi are stout, and the toes long, and furnished with strong claws. The bird is rather larger than our common partridge; it has the head, neck, and breast of a glossy greenish-black, and the remainder of its plumage deep chestnut; the bill and the naked skin surrounding the eyes are bright orange, and the feet are flesh colour.

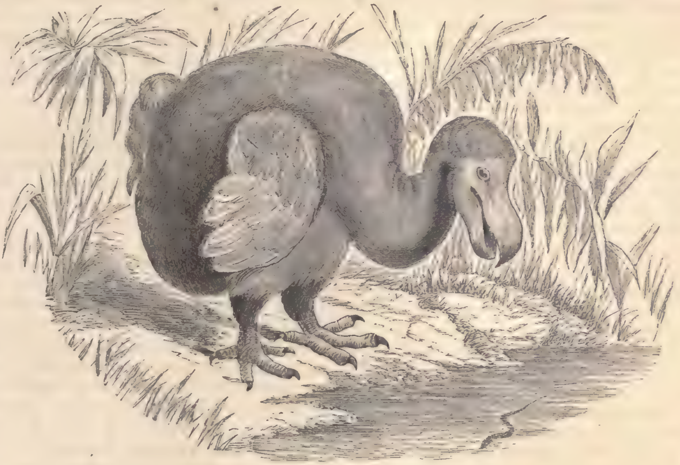
This singular bird inhabits the Navigator's Islands; it is described as dwelling principally upon the branches of trees, and feeding upon berries and fruits. It flies well, and is said to breed among the rocks in the interior of the islands. The chief interest attaching to the Dinunculus is, however, to be found in its near approach, especially in the form of the bill, to that most remarkable extinct bird, the Dodo of the Mauritius, a resemblance which, indeed, probably furnished the first inducement to Messrs. Strickland and Melville to place the latter amongst the Columbine birds.

DODOS.

THE DODO (*Didus ineptus*)—fig. 123. This singular bird, which was an inhabitant of the island of Mauritius at the time of its discovery in the year 1598, and was subsequently brought alive to Europe on several occasions by the Dutch navigators, is now known as to its external appearance only from a few pictures into which it was introduced by the Dutch painters of the beginning of the seventeenth century. The only parts of its structure still to be found in Europe consist of two heads, a foot, a few feathers, and some of its bones, which are scattered about in various museums in England and on the continent.

From the pictures above mentioned, and the descriptions of the early voyagers, it appears that the Dodo was a bulky and heavy bird, larger than a swan, and weighing sometimes as much as fifty pounds. It had a long and strong bill, with the basal portion of the upper mandible depressed and membranous. The apical part of this mandible was strong, horny, much arched, hooked, and acute, giving the organ so much resemblance to that of a vulture that the Dodo was at one time regarded as allied to those birds of prey. The nostrils were placed in the sides of the membranous base of the upper mandible, and in all respects the structure of the bill presents so great a similarity to that occurring in the Didunculus, that, on the discovery of the latter bird, the resemblance could not be overlooked. The feet of the Dodo were short and exceedingly stout, and, although presenting a certain resemblance to those of a Pigeon, indicated clearly enough that their possessor was a strictly terrestrial bird; indeed, its wings being very short, and furnished only with soft decomposed feathers, like the well-known Ostrich plumes, were quite incapable of raising it from the ground. From this rudimentary condition of its wings, the Dodo was long regarded as allied to the Struthious birds, and it is still placed in the same order with these by some ornithologists, although it must be confessed to be a very anomalous occupant of such a position. The body of the Dodo seems to have terminated in a rounded extremity, and to have been destitute of true tail-feathers, but a tuft of plumes similar to those of the wings occurred low down on its back, and probably represented the tail-coverts. The plumage of the Dodo was blackish, with the light feathers of the wings and so-called tail pale fawn colour.

Fig. 123.



The Dodo (Didus ineptus).

That the occurrence of a large and sluggish bird like the Dodo upon the distant island of Mauritius must have been a welcome phenomenon to the Dutch sailors who discovered it, cannot admit of much doubt; and we can easily understand that in their subsequent voyages to the East Indies, they were only too glad to avail themselves of the abundant supply of fresh meat afforded by the Dodos, after being restricted for months to the salt provisions of their ships' stores. It is, however, remarkable that the only relics of so singular a bird, which was certainly living two centuries ago, and of which specimens were undoubtedly imported into Europe, should be of so fragmentary a description. This is still more strikingly the case with two other species nearly allied to the Dodo, of which only a few bones are known to exist:—

THE SOLITAIRE (*Didus solitarius*) is one of those which existed, together with two other species, one of which appears to have been the Dodo, on the little island of Rodriguez. It is described by a French sailor, named Leguat, as attaining a weight of forty-five pounds, having feet and beak like a turkey's, and in other respects closely resembling the Dodo. The plumage was of a brownish-gray colour, and, according to Leguat, the birds produced a noise like a rattle by fluttering with their wings, which, he says, have the extremity of the bone enlarged into a round knob like a musket ball.

THE NAZARENE (*Didus Nazarenus*) is a bird described by another Frenchman, named François Coache. It is said to have had only three toes. The bones which are conjectured to have belonged to this bird, indicate that it must have been nearly twice the bulk of the Dodo.*

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* For further information upon these interesting birds the reader should consult the important work of Messrs. Strickland & Melville—"The Dodo and its Kindred"—and a valuable paper by Mr. Bartlett in the Proceedings of the Zoological Society.

ORDER V.—GALLINÆ.

THE gallinaceous birds, or those presenting more or less resemblance both in structure and habits with our common poultry, which constitute this order, form the real commencement of the strictly autophagous birds, or those whose young can generally run and feed themselves from the moment of their escape from the egg. These birds are usually of moderate or rather large size, and of a stout and rather heavy form. They have a small head, often partially or wholly denuded of feathers, and a bill of moderate length, of which the upper mandible is distinctly arched, and overhangs the lower one both at the tip and along the margins. As they are all essentially terrestrial in their habits, the legs are always strong and well developed. The tarsi are stout, and very commonly armed with a spur, or even with two or more such weapons, which are especially developed in the males; the toes are three in front and one behind, the latter being usually small and slightly elevated upon the back of the tarsus, but sometimes more elongated, and then placed upon the same plane as the anterior toes, so as to render it more efficient in grasping. The anterior toes are not very long, but stout, and often united by webs at the base; they are armed with strong and rather blunt nails, which are of great service to the birds in scratching in the ground in search of food, a habit common to most of the species. Hence, many ornithologists give these birds the name of *Rasores* or Scrapers. The feathers of the legs are continued down to the articulation of the tarsus, and sometimes extend beyond this point even to the extremities of the toes. The wings are generally short and weak in comparison with the weight of the birds, so that they fly heavily, and only to short distances. Their plumage is firm, and often adorned with brilliant tints, and some parts of it, especially in the males, are frequently developed to an extraordinary extent, giving the birds sometimes a grotesque, and sometimes an elegant appearance. The feathers are distinguished by the great development of the accessory plumules which spring from the base of the stem at its junction with the quill.

The gallinaceous birds are spread over all parts of the world, but the finest species are inhabitants of the warmer regions. Their food consists of fruits, seeds, herbage, insects, and worms. They are generally polygamous in their habits, each male collecting around him a seraglio as numerous as he can keep together. In keeping off the attentions of rivals he is frequently engaged in almost incessant combats. The females lay their eggs, which are generally numerous, upon the ground, in some sheltered situation. The young, as already stated, are usually able to run as soon as they leave the egg; but at night, or on the approach of danger, they shelter themselves under the wings of their mother.

FAMILY I.—CRACIDÆ.

The first family of the Gallinæ includes a small number of birds peculiar to South America, and known under the names of Curassows and Guans. They have a stout, arched bill of moderate length, with the nostrils pierced near the base of the upper mandible, usually in a sort of cere somewhat resembling that occurring in the pigeons. Their wings are short and rounded, and their tail long and ample; their tarsi are long and stout, and their toes are also long, but rather slender, and the posterior toe is situated on the same level as the anterior ones, and not elevated on the back of the tarsus. These birds reside in the luxuriant forests of tropical America; they live chiefly on the ground, where they seek the seeds and insects which constitute a great portion of their food. Their power of flight is rather limited, as, indeed, is shown by the form of the wings; but they rise freely into the trees, upon the branches of which they often roost and breed.

THE COMMON CURASSOW (*Crax alector*)—Plate 20, fig. 73—is nearly as large as a turkey, measuring about three feet in total length. It is of a shining-black colour, exhibiting purple and green tints according to the direction in which the light falls upon its feathers; the belly and tail-coverts are white. The bill in this bird is stout and black, but the basal half of both mandibles is occupied by a large yellow cere, and the eyes are surrounded by a naked skin of the same colour. The feathers of the top and back of the head are elongated and curled, forming a curious crest, which the bird can raise at pleasure.

These birds, which are also called Hoccos, are found in great flocks in the forests of tropical America, where they exhibit very little fear of man; but when they reside in the vicinity of human habitations, they become more cautious, and are seldom seen more than two or three together. They are easily domesticated, and then become very familiar, recognizing those who feed them, and even pulling at their clothes when they think themselves neglected. Their flesh, when young, is very delicate. This bird has bred freely in Holland. It lays its eggs on the ground, and the young run as soon as they are hatched.

THE GLOBE CURASSOW (*Crax globicera*) is of a blue-black colour, with the belly and lower tail-coverts and the tips of the feathers of the crest white; it is distinguished by having at the base of the bill a large hard globose, yellow swelling. This species inhabits Guiana, and is as large as the Common Curassow.

THE CASHEW CURASSOW (*Ourax pauxi*) has the upper mandible dilated upwards at the base into a large, bony, crested tubercle of a bluish colour and pyriform shape. The plumage of this species is black, with the belly and the tips of the tail-feathers white; the head is not crested, and the true bill is red. This bird is an inhabitant of Mexico; in its habits it resembles the preceding species.

THE CRESTED GUAN (*Penelope cristata*), an inhabitant of Guiana and Brazil, is about the same size as the Curassow, and is of a blackish-bronze colour, glossed with green, with the neck and breast spotted with white, and the belly and legs, the rump, and lower tail-coverts reddish. The head is adorned with a thick crest, which the bird can elevate or depress at pleasure. The base of the upper mandible is covered with a cere, and the cheeks and throat are naked; the latter being furnished with a large pendant wattle, capable of dilatation. The cheeks are violet, and the wattle of the throat scarlet.

This remarkable bird is found in small flocks in the forests, where it feeds chiefly upon seeds and fruits, which it seeks upon the ground; it walks and runs with great ease and rapidity, but flies low and heavily. According to Vieillot, this bird and its allies drink in the same way as the pigeon. Its note resembles the syllable *pi*, uttered in a sharp tone.

FAMILY II.—MEGAPODIIDÆ.

In the birds of this family, which are all inhabitants of the islands of the Eastern archipelago and of Australia, we find a considerable analogy with those which have just been described, especially in the position of the hind toe, which in these, as in the preceding birds, is placed on the same level as the anterior toes, so that its whole lower surface is applied to the ground in walking. The Megapodiidæ also have the legs naked a little way above the heel or articulation of the tarsus with the tibia, a character which likewise occurs in some of the Cracidæ. They have a stout arched bill, with the tip rather obtuse; their wings are rather short and rounded, and their feet large and powerful, indicating strictly terrestrial habits. The tarsi and toes are covered with scales.

The habits of these birds are most singular. They deposit their eggs in a heap of sand, or an accumulation of dead leaves, and trust to the heat of the sun, assisted in the latter case by the warmth produced by the decay of the vegetable matter, to maintain the temperature necessary for the evolution of the young.

THE MOUND-BIRD (*Megapodius tumulus*), called the Jungle-fowl by the Australian colonists, is an inhabitant of the north coast of Australia, where it was discovered by Mr. Gilbert in the vicinity of Port Essington. It is of the size of an ordinary fowl, and has the upper surface dark cinnamon-brown, with the back of the neck dark gray, which is also the colour of the lower surface of the body; the head is furnished with a rather short, pointed, occipital crest; the upper and lower tail-coverts are dark brown, and the tail itself blackish; the bill and feet are reddish.

Mr. Gilbert was led to the discovery of this species by observing at Port Essington numerous great mounds of earth, which the colonists asserted to be ancient tumuli of the natives. The latter, on the contrary, assured him that these elevations were formed by the Jungle-fowl for the purpose of hatching its eggs; an assertion which afterwards proved to be correct. On another part of the shore of Port Essington, in the midst of a thicket, he met with a mound of sand and shells, of a conical form, measuring about twenty feet in circumference at the base, and five feet in height, and at the top of this he found a young bird in a hole about two feet deep, lying on a few withered leaves. The old birds appear to excavate from the top of the hill, directing the course of their burrow obliquely, so that, although the eggs may be at a considerable distance from the summit, they are within two feet of the surface. After the deposition of the egg the hole is lightly filled up with the excavated materials, and the natives can detect the existence of a new laid egg, by observing the marks of the old bird's feet upon the top of the mound, when they ascertain the direction of the hole by pushing a stick down through the light earth. They even state that they can determine the length of time that has elapsed since the deposition of the egg, by the greater or less degree of resistance presented to the passage of the stick. The size of the mound is often enormous; Mr. Gilbert mentions one fifteen feet in height and sixty in circumference, which was entirely composed of the richest light vegetable mould. On extracting an egg from this mound, at a depth of five feet, Mr. Gilbert found that the surrounding materials felt quite warm to the hands, and as this, like all the other mounds seen by him, was completely protected from the rays of the sun by the thick trees surrounding it, it is evident that the warmth required for hatching the eggs must be produced in the interior of the mass of materials. The mounds are found in various situations, and differ greatly in their form and the materials of which they are composed; but it is remarkable that in some rocky situations they are found to consist of the same vegetable mould as the one above mentioned, from which Mr. Gilbert concludes that the birds must collect all the dead leaves they can find, and that the mounds must be the work of many birds, and accumulated during a considerable period of time, in order to allow the leaves to become converted into mould. The natives assert that no more than one pair of birds are ever seen upon a mound at the same time, and this is in accordance with Mr. Gilbert's observations; they also state that the eggs are laid at night, and always placed perpendicularly, both of which statements Mr. Gilbert believed to be true.

FREYCINET'S MANKIRIO (*Megapodius Freycineti*) —Plate 20, fig. 75. The other species of the genus *Megapodius* are inhabitants of the great group of Asiatic islands, where they follow the same habits of life as the Australian species just described. The present species is met with in Banda, and in the Papuan islands of Waigiou and Guébé, where it is common. It is thirteen inches in length, and of a black colour, with the neck nearly naked, and the bill and feet fulvous, the former having the tip white.

THE OCELLATED LEIPOA (*Leipoa ocellata*), called the *Native Pheasant* by the Australian colonists, is a large bird, measuring nearly two feet in length, and is of a more graceful form than the Megapodius. It has the top of the head furnished with a crest of slender feathers, and of a blackish-brown colour, and the back of the neck dark gray. The whole of the feathers of the back and wings are marked towards the tips with bands of brown, black, and grayish-white, the paler colour occupying the margin of the feathers, and thus giving the plumage an ocellated appearance; the tail-feathers are blackish-brown, broadly tipped with buff; the lower surface is pale buff, with some black bands on the flanks; the front of the neck bears numerous elongated black feathers, with a white line down the centre of each.

This handsome bird is an inhabitant of Western Australia, where it dwells principally on the barren sandy plains of the interior. Its food consists chiefly of seeds and berries. The eggs are deposited in a mound, usually about three feet in height, composed of layers of dead leaves and other vegetable matters, and covered with a coating of sand. The natives, who are very fond of the eggs, wait until the mound is completed and covered up, when they easily secure the whole stock, and the hen birds will then lay a second, and even a third time. When broken up, the mounds are always found to be tenanted by vast numbers of ants.

THE BRUSH TURKEY (*Tallegalla Lathami*)—Plate 20, fig. 74—one of the most remarkable species of this family, is a native of the brushes of New South Wales. Its characters are so singular, that by Latham, and even by Swainson, it was regarded as a vulture. It has a robust and strongly-arched bill, of a black colour; the head and neck are covered with a deep red skin, over which a few black hairs are thinly scattered, and at the base of the neck there is a large somewhat lobulated wattle of a bright yellow colour, which, at the first glance, has something of the general effect of the downy frill which frequently adorns the same part in the vultures. The plumage of the upper surface, including the ample tail, is blackish-brown, or nearly black; that of the lower surface is also blackish-brown, but each feather has a silvery-gray tip, and the feet are brown.

In its habits it is terrestrial, generally wandering about in small flocks, and when disturbed eluding pursuit by the facility with which it runs through the brush. When hard pressed, or suddenly alarmed, the flock will fly up to the lowest bough of a tree, the top of which they attain by a succession of leaps, and then fly off to another part of the brush. The mound prepared by this bird for the incubation of its eggs, consists of a vast heap of decaying vegetable matters, collected by several individuals acting in concert. The heap is formed by the birds grasping successive portions of the materials in their powerful feet, and then throwing these behind them towards the centre of the space occupied by them; and in this way they clear the surface of the ground of all herbage for a considerable distance around the mound. The eggs are large, and, as in the case of the Megapodius, are deposited in an upright position. The natives assured Mr. Gould that the old birds frequented the vicinity of the nest at the time when the young might be expected to appear, and frequently uncovered the eggs and covered them up again. This has been confirmed by the breeding of a pair in the London Zoological Gardens, the male (not the female as stated by the Australians to Mr. Gould) being assiduous in his attention to the eggs, and assisting the young birds to make their escape from the mound.

CUVIER'S TALEGALLA (*Talegalla Cuvieri*), the only other known species of this genus, is an inhabitant of the forests of New Guinea. It is a much smaller bird than the preceding, its size being only that of a small fowl, and is entirely of a black colour.

THE MALEO (*Megacephalon Maleo*), another singular species of this family, and the last to which we shall refer, is a native of the island of Celebes. It has the head naked, and furnished with a casque resembling that of the cassoway in form, and the neck clothed with a light down, amongst which are some short scattered hairs. Like the preceding species, this bird deposits its eggs in a heap of sand and vegetable matters, and leaves them to be hatched by the heat produced in the mass.

FAMILY III.—PHASIANIDÆ.

The birds of this family, some of which are amongst the most elegant and splendid of their class, are nearly all inhabitants of the eastern hemisphere, only two species being found in America; and even in the Old World their distribution is almost exclusively restricted to the warmer parts of the Asiatic continent and its dependent islands. They have a bill of moderate size and strength, of which the upper mandible is pretty strongly arched at the tip, where it overhangs the lower one; their wings are usually short and rounded, indicating but moderate powers of flight; but their tarsi are tolerably elongated and strong, and their toes rather short and stout, and terminated by pretty strong scratching claws. The hinder toe is always shorter than the anterior ones, and slightly elevated above their plane on the back of the tarsus, which is also frequently armed with one or more spurs. The form of the tail varies greatly. It is usually ample, sometimes broad and rounded at the apex, sometimes elongated and wedge-shaped, or pointed. A portion of the head is almost always bare of feathers, usually round the eyes; but in many cases a larger space is covered with naked skin, and this is not unfrequently dilated into combs and wattles of various and often curious forms.

The numerous species belonging to this family may be divided into four subordinate groups—those of the *Pheasants*, *Cocks*, *Peacocks*, and *Turkeys*, of each of which we shall now proceed to describe a few illustrations:—

PHEASANTS.

THE COMMON PHEASANT (*Phasianus colchicus*). This well-known bird, which is abundant in most parts of Britain, is not a native of this country, but has been introduced here, and into the southern parts of Europe generally, from the south-west of the Asiatic continent. The particular district from which the progenitors of the Pheasants now inhabiting Europe were derived, is supposed to have been the banks of the river Phasis, in the ancient kingdom of Colchis, on the eastern shore of the Black sea, and the bird is still abundant in a wild state in the Caucasian provinces. Its scientific names (*Phasianus colchicus*) are derived from those of the river and kingdom above mentioned.

The general appearance of the Pheasant is too well known to need any description. The haunts of the Pheasants are woods and thickets, but they never thrive except in the vicinity of water, and are even fond of taking up their abode amongst the rushes and osiers of marshy places. They are terrestrial in their habits, walking and running along the ground in the same way as the common fowl, although with more grace and swiftness. Their flight is heavy and whirring, and they rarely take wing unless menaced with immediate danger. During the summer they even roost on the ground, but pass the long nights of autumn and winter upon the branches of trees. The cry of the cock Pheasant is a peculiar short crow.

The food of these birds consists of various kinds of seeds, varied with wild fruits, green herbage, and insects. Ants, and their larvæ and pupæ, are favourite articles of diet with them. They may be seen eating blackberries, sloes, and haws, and their crops are sometimes found to be filled with acorns.

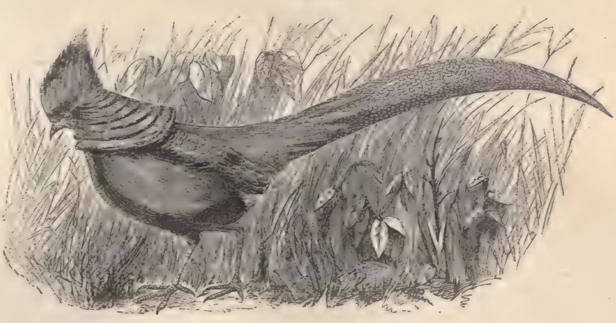
Like our common poultry, and, indeed, like all the other species of this family, the Pheasant is polygamous, and the males and females associate only during the breeding season. The females deposit their eggs, which vary from ten to fourteen in number, in a small hollow lined with dead leaves, and scratched in the ground amongst long grass, or in the midst of bushes; but so careless are they in many cases, that they have been known to drop their eggs in the nest of the partridge. When engaged in the work of incubation, however, the hen Pheasant sits very closely, and, trusting to the concealment afforded by the similarity of her brown colour to that of the ground, she will scarcely rise from her nest until nearly under the feet of an intruder. They lay freely in confinement, and the possessors of preserves usually keep a good many old birds in pens in order to maintain their stock. The eggs are hatched by common hens, and the young brought up with great care. The Pheasant is also distinguished by the facility with which it may be got to breed with other gallinaceous birds. In captivity it has bred with the common fowl and the guinea fowl, and wild hybrids between this bird and the black cock have been met with.

The common Pheasant is liable to considerable variation in its plumage. Some specimens are met with quite white, others exhibit white patches, but the most common variation consists in the presence of white feathers scattered amongst the rest of the plumage. The Ring-necked Pheasant, which has been supposed to be a hybrid between the common Pheasant and the Chinese Ringed Pheasant (*P. torquatus*), is regarded by Mr. Yarrell as a mere variety, as is also the kind known as the Bohemian Pheasant. The curious circumstance of hen Pheasants acquiring a plumage more or less resembling that of the cock bird, which was at one time supposed to be an effect of age, has been shown by Mr. Yarrell to be connected with the obliteration of the ovaries from some unknown cause, and to occur both in young and old birds.

LADY AMHERST'S PHEASANT (*Phasianus Amherstiæ*)—Plate 19, fig. 70—one of the most elegant birds of this family, is an inhabitant of continental India. The top of the head is of a green colour, but is adorned with a crest of slender crimson feathers; and from the sides and back of the head descends a beautiful white tippet, each feather of which is terminated by a green band; the tail measures upwards of three feet in length, and is of a grayish-white colour, with numerous broad green bars on each feather.

THE GOLDEN PHEASANT (*Phasianus pictus*)—fig. 123—resembles the preceding species in the possession of a crest and tippet, but is far more splendid, or rather gaudy, in its colouring. Its crest feathers are yellow, and those of the tippet golden-yellow, barred with black at the apex. The back is metallic green, the rump and tail-coverts yellow, the wings blackish, with the secondaries blue, and the whole lower surface bright red; a portion of the tail-coverts project in long hackle-like plumes of a red colour, and the elongated tail-feathers are mottled with brown and black. This magnificent bird is a native of China, where it is kept in a state of domestication. It has

Fig. 123.



The Golden Pheasant (Phasianus pictus).

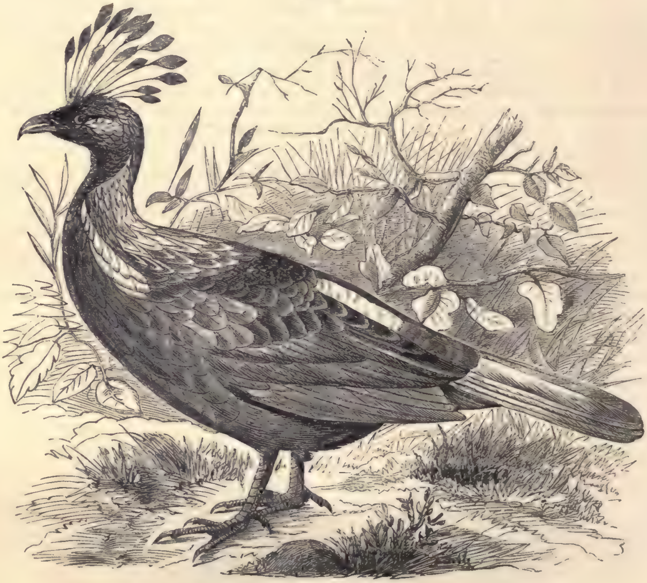
also been imported into Europe, in the milder parts of which it breeds freely in the aviaries. The female is of a dull brownish colour, with black transverse bars.

THE SILVER PHEASANT (*Phasianus nycthemerus*)—Plate 19, fig. 71—which is also a well-known bird in our aviaries, is a native of the northern parts of China. It is an active, powerful, and handsome bird, having the head adorned with a crest of elongated purplish-black feathers, and the whole of the upper surface and tail white, but with each feather of the back and wings delicately pencilled with black lines. The two central tail-feathers, which are much elongated, are pure white; the lateral ones are streaked with black; and the whole lower surface is of the same deep purplish-brown colour as the crest. The naked space surrounding the eye is of very large size, and of a bright vermillion colour. The female is grayish-brown above and white below, marked with irregular black bars.

THE FIRE-BACKED PHEASANT (*Euplocomus ignitus*)—Plate 19, fig. 69—an inhabitant of Sumatra, is a large and handsome species. It measures about two feet in length, and has the principal part of its plumage of a beautiful slaty-black colour. The crown of the head is adorned with a crest of slender feathers, with naked shafts, and its sides are covered with a naked bluish-purple skin; the feathers of the lower part of the back are of a most brilliant, fiery orange colour, whence the name of the species; the tail is somewhat forked, the feathers being turned out on each side towards the apex, somewhat as in the well-known black cock; the central feathers are white, the lateral ones black, with green reflections. The female is a smaller bird than the male, and of a general cinnamon-brown colour.

THE IMPEYAN PHEASANT (*Lophophorus Impeyanus*)—fig. 124—another splendid Indian species, is an inhabitant of the mountains of Nepaul and the Himalaya. The plumage of the upper surface of this Pheasant exhibits the most brilliant changing tints of green, blue, violet, and golden bronze, with an intense metallic lustre. The head bears a crest of elongated feathers, generally drooping towards the back of the neck. These plumes have a slender naked shaft, terminated by an oval lustrous lamina. Low down on the back there is a broad band of pure white, and the tail is ample, rounded, and bright chestnut. The lower surface is nearly black. The length of the male is rather more than two feet. The female is smaller, and reddish-brown, varied with spots and bars of black; the back of the head bears a few elongated feathers, and the front of the neck is white.

Fig. 124.



The Impeyan Pheasant (Lophophorus Impeyanus).

THE ARGUS PHEASANT (*Argus giganteus*), one of the most remarkable and magnificent species of the present family, is an inhabitant of several of the larger islands of the Eastern archipelago. The most singular feature in the structure of this bird is the great development of the secondary wing-feathers, which are nearly three times as long as the primaries, and very broad. The body of the Argus Pheasant is not much larger than that of an ordinary fowl, but the total length of the male is between five and six feet, owing to the great elongation of the central tail-feathers. The general colour of the plumage is brownish, but it is elegantly spotted and mottled with yellow and black. The secondary quills, which are often nearly three feet in length, are elegantly marked with a series of large ocellated spots, and the tail-feathers are deep chestnut, with numerous small white spots, each surrounded by a black ring. The enormously developed wing-feathers of this bird, instead of enabling it to fly with great ease and rapidity, are really hindrances to its activity in the air. It flies heavily, and only for short distances, but runs with great speed, its large wings assisting it when progressing with the wind. When displaying himself before his females, the male Argus Pheasant spreads his wings downwards, much in the same manner as the turkey cock. The ocellated spots on the secondaries then come into view, and give the bird an elegant appearance.

COCKS.

THE TRAGOPAN (*Ceriornis satyrus*)—Plate 18, fig. 68—or NEPAULESE HORNED PHEASANT, a native of Thibet and Nepaul, is a beautiful but somewhat singular-looking bird. It is about the size of a large fowl, and of a deep red colour, covered with numerous white spots, each surrounded by a ring of black. The Horned Tragopan is an Alpine species, occurring at great altitudes on the mountains of Nepaul. Two or three other species are known, all from the Himalayan range.

THE BANKIVA COCK (*Gallus Bankivus*)—Plate 18, fig. 67—which is generally believed to be the original species of most of our domestic varieties of poultry, will require but little notice. It closely resembles in its plumage some of the ordinary dunghill cocks of this country, although it is considerably less in size. It is an inhabitant of several islands of the Eastern archipelago. This bird appears to have been domesticated in the east at a very early period, and must have been introduced into Europe in very ancient times. It was well known to the Greeks and Romans, who, like our own people at a very recent period, and many eastern nations at the present day, delighted in the cruel spectacle of a cock-fight. Several other species of the genus *Gallus* are found in the eastern islands, especially Java and Sumatra, and some, amongst which is—

THE JUNGLE FOWL (*Gallus Sonneratii*), also on the continent of India. This is a fine bird, equalling in size one of our common domestic fowls. It has a large bright red comb and wattles. The general colour of its plumage is a golden or reddish-orange, with the breast and wings blackish-gray, and the tail deep green. But its most singular character consists in the dilatation of the apices of the shafts of all the long hackles into flat elliptical plates. On the neck these are of a golden-orange colour, whilst the barbs are gray, so that this part appears covered with golden spangles on a gray ground.

PEACOCKS.

THE COMMON PEACOCK (*Pavo cristatus*) a native of the forests of continental India, is, perhaps, endowed with a more gorgeous plumage than any other bird, except a few of his immediate allies. Nearly all his feathers exhibit more or less metallic lustre. The crown of his head is adorned with an elegant tuft of slender stems, each supporting a small brilliant palette at its extremity; his neck and breast are of the deepest metallic blue, with surface tints of golden-green; and his tail-coverts, enormously elongated as in the other species of this group, form a most magnificent train, adorned with hundreds of splendid eye-like spots. His general form, also, is exceedingly elegant, and when he elevates and spreads his gorgeous train in the sun, displaying it in every way, as if conscious of the admiration he is exciting, the beholder is constrained to admit that there is no creature upon which nature has lavished her powers of adornment with a more unsparing hand. The female is entirely of a sober brownish tint.

In its native regions the Peacock frequents the jungles and forests, and feeds upon fruits, seeds, and insects. It possesses considerable powers of flight, and generally roosts in high trees. The females deposit their eggs on a little grass placed on the ground among bushes. The voice of the Peacock is exceedingly harsh and discordant, its cry closely resembling the word *paon*, which is its French name. The introduction of this bird into Europe is ascribed to Alexander the Great, but the date at which it was first brought to this country is unknown. Although their flesh is dry, and by no means delicate, Peacocks formed a favourite dish at great entertainments amongst the Romans, and also found a place in the feasts of the middle ages, when they were served up in their feathers with great pomp.

THE JAVANESE PEACOCK (*Pavo muticus*) is distinguished from the preceding species by having the plumes of the crest of nearly equal breadth throughout, without any naked shaft. It is also less brilliant in its colours. It inhabits Java and Sumatra, and likewise the continent of India.

THE ARGUS POLYPLECTRON (*Polyplectron bicalcaratum*). The Polyplectrons, so named from their having two or more spurs on each tarsus, whilst the true Peacocks, and all the other Phasianidæ, have only one, are further distinguished by the peculiar construction of the tail, which has its superior coverts considerably elongated, but still, less so than the true tail-feathers, of which they cover only about two-thirds. The fore part of the head is adorned in these birds with a sort of crest formed of elongated feathers. These, in the present species, are brownish-black; the head and neck are blackish, with the throat nearly white; the upper surface is yellowish-brown, with numerous black spots, and with an ocellated spot of a fine bluish-green colour at the tip of each feather; the lower surface is brown; the tail is composed of twenty-two feathers, which form, when expanded, a broad rounded fan. These, and the tail-coverts, which constitute as it were a second tail, extending, as already stated, about two-thirds of the length of the true tail-feathers, are of a yellowish-brown colour, mottled with black, and all of them bear near the extremity a pair of most beautiful green spots, each surrounded by a black ring. This beautiful bird measures about eighteen inches in total length. It is an inhabitant of Malacca and the adjacent islands.

THE TIBETAN POLYPLECTRON (*Polyplectron Tibetanus*), a species nearly allied to the preceding, is about twenty-two inches long, and inhabits the mountains of Tibet, probably extending into China. Its colour is brown, barred on the lower surface with blackish-brown, and mottled above with grayish-white. The feathers of the wings, except the primary quills, are each adorned near the tip with beautiful eye-spots of blue, changing in certain lights to purple, and exhibiting an opaline lustre. Each of these spots is surrounded by a narrow black circle, and beyond this with one of yellowish-white. Each feather of the two ranges forming the tail is adorned with a pair of similar, but larger spots, which, however, scarcely equal those of the wings in brilliancy.

TURKEYS.

THE COMMON TURKEY (*Meleagris Gallopavo*). The birds which we include under this category are the True Turkeys and the Guinea Fowl, which are distinguished from the rest of the Phasianidæ by their short pendant tails, and the naked wattled skin with which the whole of their heads and the greater part of their necks are covered.

The Common Turkey is a well known inhabitant of our poultry-yards, in which his large size and uncouth gestures when endeavouring to pay court to the females of his seraglio, render him a conspicuous object. This bird, unlike all the preceding species of the present family, is a native of North America, in the less frequented parts of which it is still to be met with in a wild state. The wild birds are larger and finer than the generality of our domesticated individuals; the adult male measures about three feet and a half in length, and his black plumage exhibits metallic purple and bronzed-green tints of far greater brilliancy than any we are in the habit of seeing upon the finest of our domestic specimens. The quill-feathers, both of the wings and tail, are variegated with buffy-white in the wild as in the tame specimens; the head and all the front of the neck are covered with a bare red skin, adorned in parts with bright blue tints, and swelling out towards the base of the neck into a sort of lobulated wattle, which is capable of considerable distension when the bird is excited. Above the base of the bill there is a subcylindrical fleshy appendage which is also capable of being distended, and then hangs down in a curious manner at one side of the bill. The breast exhibits a tuft of long black hairs.

The wild Turkeys are met with in flocks in the forests of North America; the old males keeping by themselves, and the females, with their young associates, in larger parties. These keep as much as possible out of the way of the adult males, the latter taking every opportunity of maltreating, and even destroying the younger individuals of their own sex. They are polygamous in their habits, and during the breeding season the males display themselves before the females in exactly the same way as the domesticated birds, strutting about with their tails spread and erected, their wings drooping to the ground, their heads drawn back, and their wattles dilated, uttering at the same time that peculiar gobbling sound which must be familiar to all our readers. The whole demeanour of the bird under these circumstances betrays an almost convulsive state of excitement, which, however, he seems to find so delightful, that in order to prolong it he will, if possible, destroy the eggs laid by the female so as to prevent her sitting, and thus removing herself from his attentions. The female accordingly always selects some secret place for the reception of her eggs; and those who keep Turkeys are well aware that this tendency to lay in out of the way places has not been eradicated in the hen Turkey by domestication. It is said that sometimes several females deposit their eggs in the same nest, so that one or more may always be on the spot to protect them.

The food of the wild Turkey consists of seeds and fruits of all kinds, grass, and insects. It seeks its food and passes most of its time upon the ground, but roosts at night upon the branches of trees. Its power of flight is, however, but limited, and, when, in journeying from one part of the country to another, a flock of these birds comes to a river, they mount to the tops of the highest trees on the bank, and from this position of vantage, take flight for the opposite shore. Even with this precaution, however, many of the weaker individuals often fall into the water.

THE OCELLATED TURKEY (*Meleagris ocellata*), the only other known species of this genus, is a native of Honduras, where it does not seem to be very abundant. It is about the size of the common Turkey, but far more splendid in its tints. The general colour of the plumage of the body is a bronzed-green, with each feather bordered with two lines, the first of which is black, and the outer one golden-bronze. The greater wing-coverts are bright chestnut, and the quills elegantly variegated with black and white. The upper tail-coverts and the quill-feathers of the tail are brownish-gray, mottled and banded with black, but towards the extremity each of them exhibits a band of variable green and blue, bounded above and below by a strong black line, and beyond this the tip of the feather is of the most beautiful coppery or bronzed-golden colour, so that, as these feathers are arranged in four ranges one above the other, the whole tail exhibits four transverse rows of brilliant eye-like spots. The naked skin of the fore part of the head is red, and exhibits an elongated wattle above the base of the bill as in the common Turkey; that of the neck is livid, and its lower part is not lobulated.

THE GUINEA FOWL (*Numida Meleagris*)—Plate 19, fig. 72—another well-known domestic species, has the head and neck naked, the crown of the head adorned with a hard black casque, and the base of the bill furnished with large wattles. The general colour of the plumage is pearly-gray, mottled all over with small white spots. The tarsi have no spurs. This bird is a native of the warmer parts of Africa, where it is usually met with in small flocks or families, but at some seasons these unite to form large companies. It is a restless and quarrelsome bird, and very noisy, constantly uttering a loud harsh cry resembling the syllables *ca-mac, ca-mac*, frequently repeated. The Guinea Fowl is partial to marshy places, where it finds abundance of worms and insects, on which it is fond of feeding; it also eats grain and fruits of various kinds. It roosts in trees, and the female deposits her eggs, sometimes to the number of twenty, on the ground in the midst of a tuft of grass or a thicket. Both the flesh and the eggs of this bird are exceedingly good, and for this reason it is kept in our poultry yards, although its noisy quarrelsome habits render it rather a nuisance.

THE CRESTED GUINEA FOWL (*Numida cristata*) is a good deal smaller than the common species, and instead of a casque, the crown of its head is adorned with a crest of decomposed hairy plumage. Its plumage is blue-black, with numerous small gray spots; the primaries are yellowish-brown, and the edges of the secondaries white. The head and neck are bare, and of a livid blue colour, tinged in part with red. This species is found in Southern Africa; its habits resemble those of the preceding species.

FAMILY IV.—TETRAONIDÆ.

The birds of this family, which includes the well-known grouse, partridges, and quails, and their allies, are generally of smaller size than those of the preceding group, and far less striking either for elegance of form or brilliancy of colour. They have a short and rather broad bill, of which the upper mandible is considerably arched, compressed towards the tip, and rather obtuse at the point; the nostrils, which are placed at the base of the upper mandible, are frequently covered with feathers, or concealed by a hard scale; and the feet are rather short and moderately stout, generally scutellated, but sometimes covered with somewhat hair-like feathers to the extremity of the tarsi, or even of the toes. The hind toe is small, and slightly elevated upon the back of the tarsus, which is most commonly destitute of spurs.

These birds are very generally distributed over the face of the globe, but the most typical species of the family inhabit the forests and heaths of mountainous countries. Their food consists partly of vegetable and partly of animal matters, such as seeds, fruits, and the young shoots of plants and trees under the former category, and worms and insects under the latter. Some of them are polygamous, but many pair; and in the latter, at least, both the male and the female assist in rearing the young.

THE CAPERCAILZIE (*Tetrao Urogallus*), also called the WOOD-GROUSE, and the COCK-OF-THE-WOODS, one of the largest and finest species of this family is widely distributed over Europe, but is more abundant in the north than in the south of that continent. It was formerly not uncommon in the Highlands of Scotland, but the species was extirpated there nearly a century ago, and it is only of late years that attempts have been made to introduce it again into the Scotch forests with some degree of success. The cock bird, which is considerably larger than the hen, measures about three feet in length, and is mottled with gray and brownish-black, but has the neck and breast black, with a greenish gloss; the female is of a pale yellowish-brown colour, with white and blackish-brown markings. The bill in the male is white, and in the female brown; and the male has a patch of bright scarlet naked skin over each eye. The tarsi are feathered down to the base of the toes. In Scandinavia the food of the Capercailzie is observed to consist principally of the young leaves and shoots of the Scotch fir (*Pinus sylvestris*), but it likewise feeds upon seeds and berries of various kinds. The breeding season commences very early in the spring, when the male takes up his post on some elevation, displays his plumage in the manner of a turkey-cock, and utters a loud cry, compared with the words *peller-peller-peller*, frequently repeated with constantly increasing rapidity, and terminating in a sort of gulp and drawing in of the breath. This singular call brings the females together from the neighbouring parts of the forest. The cock birds are exceedingly jealous, especially of their younger brethren, whom they endeavour to prevent from displaying themselves or calling. The hens lay from six to twelve eggs, which they deposit on the ground. The Capercailzie may be domesticated with ease, and even breeds readily in confinement.

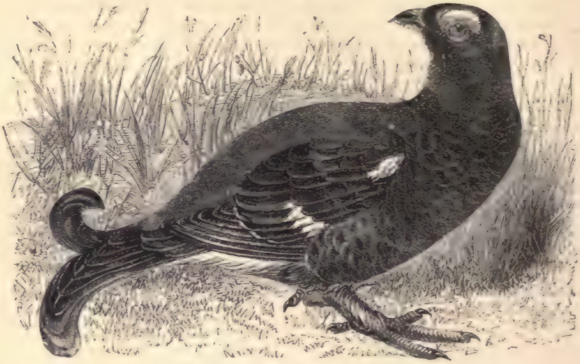
THE BLACK GROUSE, or BLACK COCK (*Tetrao Tetrix*)—fig. 125—another fine species, is still met with in the mountainous districts of the North of England, and pretty abundantly in those of Scotland. It also commonly occurs in the north of Europe, and on the mountains in the south. The whole length of the male bird is about twenty-two inches; its plumage is glossy black, with the lower wing and tail coverts and the bases of the secondary quills white, and a large naked patch of bright scarlet over each eye. The tail in the male is also of remarkable construction, the four outer feathers on each side being elongated and turned outwards, so as to give it the appearance of a double hook. This peculiarity is wanting to the female, which is four or five inches shorter than the male; her plumage is pale chestnut-brown, barred and freckled with black. The Black Grouse feeds upon the young shoots of heath and other shrubs and trees, and in its habits closely resembles the Capercailzie.

THE PINNATED GROUSE (*Tetrao cupido*). This curious species, which was formerly abundant in the United States of North America, but is now nearly extirpated, at least in the more populous districts, is rather smaller than the black cock, and is of a yellowish-red colour, with black bars and other markings. Its most remarkable character consists in the presence in the male of a pair of curious wing-like tufts on the sides of the neck, each composed of about eighteen narrow feathers, of which the longest are five inches in length. Beneath each of these is a pendulous, wrinkled fold of skin, which is capable of being inflated with air, and then, as stated by Wilson, resembles in bulk, colour, and shape, a middle-sized orange. During the breeding season the male produces a curious call, which, from its resemblance to the distant sound of a horn, is called *tooting;* and is said to be audible at a distance of three or four, or even five or six miles.

At this period, also, the males are in the habit of assembling in some open glade about dawn, where they strut about and display themselves with extraordinary ostentation, occasionally varying these exercises by violent combats.

THE COMMON GROUSE, or **RED GROUSE** (*Lagopus scoticus*). The genus *Lagopus*, which includes several species inhabiting the north of Europe and America, is distinguished by having the feet feathered down to the extremities of the toes. The Red Grouse is the best known species in the British Islands, to which, singularly enough, it appears to be exclusively confined; it is found in the mountainous districts both of England and Ireland, but is most abundant in the Highlands of Scotland. It inhabits the wild heaths and moors, and feeds upon the tender extremities of the branches of the heather, with cranberries, whortleberries, and other fruits and seeds. Unlike the preceding species, the Red Grouse pair, and the young when hatched are tended by both their parents. The female lays from eight to fifteen eggs in a nest formed of a few stems of heath and grass put together in a hollow of the ground; she lays very early in the spring, and sits very closely.

Fig. 125.



The Black Grouse (Tetrao Tetrix)

The Red Grouse is about sixteen inches in length, and the general colour of the plumage in the adult male is a fine rich reddish-brown, more or less marked with narrow transverse bars of black. The females are paler. Both sexes vary somewhat in colour at different seasons, but, unlike the nearly allied ptarmigan, the Red Grouse does not become white in winter. The quantity of these birds killed every year by sportsmen is enormous, and poachers probably destroy an equal if not greater number; so that one is astonished that a bird so mercilessly persecuted should still be able to maintain its position on our moors.

THE PTARMIGAN (*Lagopus vulgaris*) is now met with in this country only on the mountains of Scotland, where it dwells amongst the gray rocks of the highest ranges. It is generally distributed on the mountain chains of Europe, especially towards the north, and also occurs in the northern parts of America. The Ptarmigan is rather smaller than the red grouse. The colour of its plumage in summer is gray, marked with numerous transverse black bars, especially on the upper surface; the lower parts are usually white, and the amount of white in the plumage varies greatly with the season of the year. In the winter the plumage becomes pure white. In summer the Ptarmigan trust to the similarity of their coloration to that of the lichen-coated rocks upon which they sit, to escape observation; and this similarity is so great that a person might pass through the midst of a numerous flock of them without seeing a single bird. Like the red grouse, the Ptarmigan pairs and breeds very early in the spring.

THE VIRGINIAN QUAIL (*Ortyx virginianus*) belongs to a small group of species peculiar to America, and distinguished by having two teeth on each side of the tip of the lower mandible. These birds represent in the New World the Partridges of the Eastern hemisphere. The Virginian Quail, or Partridge, as it is sometimes called, is of a reddish-brown colour above, and on the neck and upper part of the breast; the cheeks, throat, and a band on each side of the neck, are white, as is also the lower surface, which is crossed by numerous undulated black bars; the primary quills and tail are dusky ash colour. The length is about nine inches. This bird inhabits the greater part of North America, and frequents woods and plantations. Its nest is carefully made under the shelter of a thick tuft of grass; it is composed of leaves and grass, and is covered above, with an opening on each side.

THE CALIFORNIAN QUAIL (*Callipepla californica*). which is nearly allied to the last species, is a native of California, where it is met with in the low woods and plains. It is distinguished by having the crown of the head adorned with a graceful crest of elongated black feathers, which generally lie backwards, but are capable of being erected at the pleasure of the bird.

THE COMMON PARTRIDGE (*Perdix cinerea*). This well-known bird, which is generally distributed in Britain, is found equally abundantly in almost all parts of Europe, and also inhabits the north of Africa, but it appears that those individuals which pass farthest to the north and south migrate into the more temperate regions at the approach of the cold or hot seasons. Partridges are generally met with about corn-fields, where they feed upon seeds, tender herbage, and insects. They pair early in the spring, and the female deposits from ten to fifteen eggs in a small hollow scratched in the ground and lined with a little straw. The business of incubation, which occupies three weeks, is left entirely to the female, although the male is assiduous in his attendance upon his mate, and endeavours to protect her from any danger. The young when hatched accompany their parents in search of food, and the small parties thus formed, known as *coveys* by sportsmen, keep together throughout the autumn and winter, if not destroyed by the gun, for the number of partridges annually killed for the table is probably equal, if not superior, to that of the grouse which undergo the same fate, and excites one's astonishment that the whole race has not long since become extinct. The parent birds exhibit much courage in defending their young brood from the assaults of their natural enemies. Mr. Selby mentions an instance in which a pair of partridges seized a carrion crow which had probably evinced felonious intentions towards their newly-hatched family, and held the marauder until it was taken from them by the spectator of the combat.

THE RED-LEGGED PARTRIDGE (*Caccabis rubra*)—Plate 20, fig. 76—also called the GUERNSEY PARTRIDGE, is a handsome bird, and rather larger than the Common or Gray Partridge. It is of a brown colour above, pearl-gray on the breast, and fawn colour on the belly; the throat is white, and surrounded by a broad black gorget, below which numerous black streaks and spots descend towards the breast, and the feathers of the flanks are beautifully adorned with transverse bars of pearl gray, white, black, and fawn colour. The bill and legs are bright red. This bird is a native of Southern Europe, and has been introduced into Britain. In its habits it resembles the common species.

THE COMMON FRANCOLIN (*Francolinus vulgaris*). In the Francolins, which are closely allied to the true Partridges, the tarsi of the males are armed with one or two spurs. They are peculiar to the Eastern hemisphere. The present species, which is widely distributed over the south of Europe, Asia, and the north of Africa, is about twelve inches in length, and is of a yellowish-brown colour above, marked and barred with black, and deep black beneath, with numerous oval white spots. Round the lower part of the neck there is a broad collar of chestnut red. This bird lives in numerous companies in the low and marshy districts of the forests, and perches freely upon the branches of trees. Its food consists of seeds and the bulbous roots of plants, which it is able to dig out of the soil. Its flesh, like that of the other Francolins, of which there are many species, is very good.

THE COMMON QUAIL (*Coturnix dactylisonans*) is generally distributed in Europe, and, indeed, apparently over the whole of the Old World. In Europe and Africa the Quails are migratory, passing northwards in countless flocks in the spring, and returning to the warmer regions at the approach of winter. This is also the case in Arabia and Asia Minor. It was formerly a matter of dispute whether this was the bird referred to in the book of Exodus as furnishing the Israelites with a supply of animal food during their journeying in the wilderness. Now-a-days there seems to be little doubt upon the subject, as no other species of Quail is known to perform a migration, and this bird, as described by the sacred historian, always travels at night. Both M. Temminck and Mr. Yarrell consider the migration of Quails to be rather in search of food than for the sake of uniformity of climate.

The Quail measures about seven inches in total length. It has the upper parts brown, with the shafts of the feathers paler, and numerous longitudinal darker streaks; the breast is pale chestnut-brown, with the shafts of the feathers yellow; the throat and belly are nearly white, the former bounded by two narrow semicircular brown bands, bearing a black patch in the middle. These latter marks are wanting in the female. Quails, although so nearly allied to the Partridge, are, unlike them, polygamous in their habits. The female lays from seven to twelve eggs in a small cavity in the ground lined with a little grass and straw, generally in a corn-field. The cry of the male resembles the syllables *pickerwick*, or *peek-wheet-wheet*. In China the males are kept in captivity for the purpose of fighting, which they do with great courage, and the people are said to stake large sums upon the issue of these contests. A similar practice prevailed to a great extent amongst the ancient Greeks and Romans, and is said not to have entirely died out among their descendants.

THE CHINESE QUAIL (*Coturnix Chinensis*), a small and elegant species, measuring only four inches in length, which is abundant in many parts of Eastern Asia, is also said to be kept in cages by the Chinese, not only on account of the sport to be derived from its pugnacity, but also for the singular purpose of warming the hands of its owners in winter, the bodies of these birds being supposed to contain an unusual amount of heat.

THE ANDALUSIAN QUAIL (*Hemipodius tachydromus*), an inhabitant of Southern Europe and Northern Africa, is distinguished from the preceding species by the total absence of the hinder toe. It is a small species, about six inches in length, of a brown colour above, and yellowish-white beneath, with the breast and throat pale chestnut; the upper surface is variegated with bars and spots of chestnut, black, and yellowish-white. This bird is found in barren spots, and runs with great speed amongst the scanty herbage. It appears to perform at least a partial migration from Africa into Europe; a single specimen has been killed in this country. It is supposed to be polygamous. Other species nearly allied to this are met with in Africa and India, and no less than eight occur in Australia.

THE CROWNED PARTRIDGE (*Rollulus cristatus*)—Plate 20, fig. 77—is an example of a singular genus including only three or four species, which has been placed by different naturalists amongst the pheasants, partridges, and pigeons. Its true place appears to be with the partridges, but it is distinguished from all the preceding forms by the absence of the claw upon the hinder toe. The Crowned Partridge is about ten inches in length, and of a green colour, with steel-blue and purple tints on the head and lower surface; the wings are brown, and the crown of the head is adorned with an ample crest of orange-red hair-like feathers, at the base of which there is a white band. This bird inhabits the forests of Java, Sumatra, and Malacca, avoiding the plains, and concealing itself in the deepest thickets.

FAMILY V.—PTEROCLIDÆ.

The birds forming the present small family were long placed with the Tetraonidæ, from which, however, they differ in several important particulars. They have long pointed wings, indicating a much greater power of flight than prevails amongst the Tetraonidæ, or, indeed, in any other group of gallinaceous birds; their tails are also elongated and pointed, and in some species the two middle feathers are much prolonged. The bill is nearly straight, the tarsi are elongated and clothed in front with short, downy feathers; the hinder toe is quite rudimentary, and placed high up on the back of the tarsus, and the three anterior toes are short and broad. The Pteroclidæ live in the sandy deserts of the hot regions of Africa and Asia, over which they wander to great distances in large flocks. They are generally seen in the vicinity of springs and streams, and hence their appearance is welcomed by travellers in the desert as evidence of the proximity of water. Like the partridges, they pair, and the female deposits about four or five eggs.

THE BANDED SAND-GROUSE (*Pterocles arenarius*), which is most abundant in Northern Africa, is also met with in the vast plains of the south of Russia, and individuals, probably stragglers from either of these localities, have been killed in various parts of Southern Europe. The general colour of this bird is yellowish-brown mixed with gray, and banded with brownish-black on the upper surface; the male has the belly, a band across the lower part of the breast, and a patch on the throat, brownish-black; in the female, the plumage is paler beneath, and the throat bears a gray patch. The length of the bird is from twelve to fourteen inches. The nest of this species is made amongst stunted bushes and herbage, and the number of eggs is said to be only four or five. Its food consists of insects and seeds.

THE PIN-TAILED SAND-GROUSE (*Pterocles alchata*) has a much stouter bill than the preceding, and the central tail-feathers are greatly elongated. Its plumage is variegated with olive, yellowish, and reddish tints, and with black; the belly is white, and the breast bears a fulvous crescent edged with black; the tail is banded with brown. The length of the bird is about fourteen inches. This species is found not only in Africa and Asia Minor, but also in Southern Europe, principally in Spain and the Landes of France. In its habits it resembles the preceding species.

PALLAS' SAND-GROUSE (*Syrrhaptes paradoxus*) is a singular species, inhabiting the central parts of Asia, where it was discovered by the celebrated traveller, Pallas. The structure of the feet is very remarkable; the tarsi are short and thick, and entirely clothed with minute feathers; the hinder toe is entirely wanting, and the anterior ones excessively short. The male has the two centre feathers of the pointed tail produced and filiform, as also the first primary feather in each wing; these peculiarities are absent in the female, which, in other respects, closely resembles her partner. The length varies from about nine to eleven inches. This bird walks very badly, but flies well. It lives on the barren steppes of Bucharia and Tartary, where it feeds on the seeds which it finds amongst the sand. Its nest is placed among stones, or under the shelter of some stunted shrub, and composed of a few stalks of grass. The eggs are said to be four in number.

FAMILY VI.—CHIONIDIDÆ.

This is another family containing a few species whose characters are so curious as to have rendered their position in the system somewhat doubtful. They have a short and stout bill, which is compressed at the tip and considerably arched; the nostrils are situated at the base of the upper mandible, and protected by a more or less inflated cartilaginous plate. Like the birds of the preceding family, they have long and pointed wings; their tarsi are of moderate length and thickness, naked and reticulated quite up to the articulation, and terminated by four toes, of which the anterior are tolerably long, and the posterior one small, and slightly elevated upon the back of the tarsus. These singular birds are met with upon the sea shores of the southern parts of America, and upon those of New Zealand, Australia, and other islands in the great southern ocean.

THE WHITE SHEATHBILL (*Chionis alba*)—Plate 20, fig. 78—has the basal half of the upper mandible surrounded by a horny sheath of peculiar construction, beneath which the nostrils open; its cheeks are naked and yellowish, and furnished with wattles of the same colour; its plumage is white, as is also its bill, and its feet are reddish-black. Its length is about fifteen inches. This bird is met with upon the shores of Patagonia, New Zealand, and Australia, and also upon many of the islands of the Antarctic seas. It is a solitary and shy bird, which dwells amongst the rocks of the sea-shore, and feeds upon the mollusca and other small marine animals which it can pick up there. According to some writers it also devours carrion, but this does not appear to be a general habit with it, and several travellers describe its flesh as being very good.

D'ORBIGNY'S THINOCORE (*Thinocorus Orbignyanus*). This bird, which with two or three other species, resides in the littoral districts of Chili, differs from the preceding in the greater comparative length and slenderness of the tarsi, and in the absence of the peculiar sheath at the base of the bill, and of the naked carunculated space on the cheeks. It greatly resembles a small snipe. These birds live in small troops in the valleys between the mountains of Chili, frequenting the most desert spots, and feeding upon plants, roots, and insects. They nidificate on the ground.

LATREILLE'S ATTAGIS (*Attagis Latreillei*), another Chilian species, is about the size of a quail, and in its general appearance resembles the sand-grouse already described. Its general colour is a light brown, darkest on the back, which is also barred with black; the wing coverts are margined with white, and marked with black lines. Nothing is known of the habits of this bird, nor of those of a second species occurring at the Straits of Magellan and in the Falkland Islands.

FAMILY VII.—TINAMIDÆ.

This, the last family of gallinaceous birds, must be regarded as making a near approach to the Grallæ, and especially to the Bustards, which, in their turn, appear to be the most closely allied of all the so-called Waders with the birds forming the present order; indeed, by some ornithologists the Bustards are placed amongst the Gallinæ. In the Tinamidæ the bill is rather elongated, and either nearly straight or slightly curved throughout, and usually rather suddenly hooked at the tip; the wings are short, rounded, and concave, indicating but small powers of flight; the tarsi are elongated, scutellated in front, reticulated on the sides, and naked quite up to the articulation; the anterior toes are rather long, and the posterior ones very short, and incapable of being applied to the ground.

The birds of this family are all inhabitants of South America, where they are called *Ynambus* by the Indians, and Partridges or Quails by the Spanish colonists, according to their size. They reside principally in the open fields, but some frequent the vicinity of woods, to which they then resort for shelter at night, taking up their position upon the lower branches of the trees to avoid the attacks of animals of prey. They all prefer concealing themselves at the approach of danger to seeking safety by their somewhat heavy and laborious flight, and thus are easily knocked down with a stick, or captured by means of a noose at the end of a rod, when their hiding-place is discovered. They deposit their eggs, generally to the number of about seven, upon the ground in the midst of a tuft of herbage; the young do not long accompany their parents. Their food consists partly of insects and worms, and partly of grain; the latter they often seek in the newly-sown corn-fields.

THE GREAT TINAMOU (*Tinamus Brasiliensis*), which is about eighteen inches in length, is an inhabitant of Cayenne and Brazil, where it resides in the woods. Its general colour is olive, spotted with black on the back and tail; the crown of the head is reddish, and the primary quills ashy gray.

THE TATAUPA TINAMOU (*Tinamus Tataupa*) is a much smaller species than the preceding, measuring only about nine inches in length; it has the head, neck, and lower surface as far as the legs, lead-gray, the throat white, the upper surface brown, and the rump black, with a white margin to each feather. The bill is bright red, and the legs purplish. This species inhabits the same regions, and has much the same habits as the last; its shyness is so great that when kept in captivity it will not come out of its place of concealment, even to feed, when anybody is in sight.

THE SPOTTED TINAMOU (*Nothura maculosa*), a native of Brazil and Paraguay, is captured for the table in immense quantities by hunters on horseback, provided with a rod from six to nine feet in length, with a loop at the end of it composed of the stem of a feather. When the hunter discovers one of these birds he rides round it, gradually coming nearer, and the stupid bird sits still until the noose is placed round its neck.

THE CRESTED TINAMOU (*Tinamotis elegans*), the species which makes the nearest approach to the Bustards in its general aspect and in the structure of its feet, is a rather large bird, distinguished from all the preceding species of this family by its possession of an elongated crest depending from the back of the head. It inhabits the pampas of Buenos Ayres, and is described as being scarcely able to fly; it exhibits the same desire for concealment that is evinced by the other specie when threatened with danger, but seeks a better hiding place, making its way into the burrows of the viscachas and armadillos, which inhabit these extensive plains in its company. Its eggs are large, and of a brilliant green colour.

ORDER VI.—CURSORES.

ALTHOUGH the birds forming this order (the Ostrich and its allies) have been regarded by some writers as belonging to the Grallæ, or Wading Birds, and by others as members of the order Gallinæ, it appears to us that they present so many peculiarities of organization as to be certainly entitled to form an independent group. And this view is further supported by the fact that the principal organic remains of birds which have been met with in the tertiary and post-tertiary beds belong to species of this type of structure, which appears to have been far more widely diffused in earlier periods than at the present day, so that we may justly conclude that in the existing forms we have only an imperfect representation of an extensive group, of which the principal portion has long since become extinct.

The principal characteristic of these birds consists in the rudimentary nature of their wings, which (as shown in our figure of the skeleton of the Ostrich—Plate 36, fig. 135), although composed of the same bones as those of other birds, are quite disproportioned to the size of the body, and completely incapable of elevating the bird into the air. In some cases these rudimentary members are but imperfectly furnished with feathers, in others they are fully plumed, but even then seem only to be of use to the bird in the manner of sails, to catch the wind and assist it in running. This imperfection of the wings is accompanied by a modification of the sternum, which, instead of exhibiting the strong keel which usually occupies its centre in birds endowed with the power of flight, presents the form of a convex shield. The bones of which the skeleton is composed are also almost destitute of those large air cells, which in other birds reduce their weight so greatly, and thus facilitate their motion in the air.

As these birds are thus destined to a strictly terrestrial mode of existence, their whole conformation is adapted to the augmentation of their power of running, which they do with extraordinary swiftness, and hence the name of *cursores* or *runners*, is applied to them with great propriety. The pelvis, which gives attachment to the legs, is very large and firm, and the pubic arch is complete, a structure which does not occur in other birds. The anterior part of the pelvis also encases the lumbar region of the spine, and thus the whole apparatus becomes very large and strong. The legs are greatly developed, both in length and strength, and terminated by two or three toes, which generally form a sole of great firmness. In only one living genus, the curious *Apteryx*, do we find any trace of a hinder toe, and this is very rudimentary.

The neck is elongated in proportion to the length of the legs, and in most of the species the bill is short, depressed, broad, and triangular when viewed from above; in the genus *Apteryx*, on the contrary, the bill is long and nearly cylindrical. The character of the plumage is very peculiar, the feathers of the body being always furnished with long separate barbs, which in most cases present more resemblance in their general aspect to hairs than to feathers. The head and neck are frequently naked, or clothed only with down.

In their internal structure these birds also present some curious peculiarities; their fleshy tongue is free at the tip, and they have a sort of rudimentary bladder and traces of a diaphragm separating the thoracic from the abdominal cavity—characters which, the latter especially, have been considered to indicate some slight approach to mammalian structure.

The living species form two families, of one of which the Ostrich, and of the other the *Apteryx*, is the type.

FAMILY I.—STRUTHIONIDÆ.

The general characters of this family have been indicated above, by contrast with those peculiarities mentioned as pertaining exclusively to the genus *Apteryx*. The birds forming this genus have long, muscular, and powerful legs, terminated by two or three toes, and without the smallest rudiment of a hinder toe; the neck is elongated, and generally naked or clothed only with down; and the bill is broad, depressed, and triangular, with the nostrils situated in a groove near the base of the upper mandible.

THE OSTRICH (*Struthio Camelus*)—Plate 21, fig. 79—an inhabitant of the vast sandy deserts of Africa, is the largest of living birds, measuring from six to eight feet in height when it carries its head erect. It is distinguished from all the other species by the structure of the feet, which have only two toes, of which the outer one is considerably shorter than the inner. The general appearance of this magnificent bird is well shown in our figure; its plumage consists of very soft decomposed feathers, of which those of the wings and tail are greatly developed, and constitute the well-known Ostrich plumes.

Over the boundless African deserts the Ostrich roams in flocks, trusting, like the antelopes and other quadrupeds of these regions, to its swiftness of foot for security from animals of prey or the pursuit of man. So rapid is its course, indeed, that the swiftest horse is unable to keep up with it, and the hunters are compelled either to bewilder it by approaching it in different directions, or to drive it in a circle by continually relieving each other in the pursuit, until the swift runner is tired out. When in imminent danger, the Ostrich frequently defends himself by violent kicks with his feet.

The food of the Ostriches consists of herbage, seeds, insects, worms, and snails, and probably of almost any nutritive materials that come in their way; in captivity they are known to be by no means particular in their choice of diet, swallowing even such indigestible articles as leather, wood, and iron. Whether these hard substances assist the digestion of the bird like the small stones swallowed by many other granivorous species, we can hardly say; but there is certainly no foundation for the belief, formerly widely spread, and perhaps still entertained by the ignorant, that the Ostrich is capable of digesting metals.

In its native wilds the Ostrich is polygamous in its habits. The eggs, which are of large size, usually weighing about three pounds, are deposited to the number of ten or twelve in a hole scratched in the sand, where their evolution is effected principally by the heat of the sun. The female, however, watches over them carefully, and sits upon them at night. The young birds can run as soon as they quit the egg.

THE NANDU (*Rhea americana*)—Plate 21, fig. 80—also called the Rhea and the American Ostrich, is not more than half the size of the African species, from which it differs structurally in having three toes upon each foot and the head and neck clothed with downy feathers, and in the total absence of tail-feathers. The plumes of the wings are elongated and decomposed, somewhat resembling in their structure those of the African Ostrich, to which, however, they are far inferior in delicacy, and are only employed in the manufacture of light brooms. This bird is found abundantly in the great plains of South America, nearly down to its southern extremity; it lives in flocks, and is polygamous, but according to the late Earl of Derby the male bird scratches the hole in the ground for the reception of the eggs, which he collects from the scattered places where they are frequently deposited by the females, and afterwards sits upon them. According to Mr. Darwin, the males, when thus engaged, sit so closely that they may almost be ridden over before they will stir; but at the same time they are so fierce, that if disturbed they will often attack the intruders, and have even been known to leap up and endeavour to kick a man on horseback. These birds, according to Mr. Darwin, show no reluctance to take the water, but will swim easily but slowly across even broad and rapid rivers, or from island to island in bays. They are hunted by men on horseback, and captured either by means of the lasso, or with an instrument composed of two large balls or heavy stones, united by a long leathern thong. The latter instrument is thrown at the legs of the bird, which it binds together, and, of course, prevents all further progress.

THE EMEU (*Dromaius Novæ-Hollandiæ*)—Plate 22, fig. 82. In the Emeu, as in the remaining species of this family, the feet consist of three toes; its distinctive characters consist in the position of the nostrils, which open not far from the tip of the upper mandible, in the complete concealment of the wings under the hair-like feathers of the body, and in the claws of all the toes being nearly equal in length. This bird is inferior in size only to the African ostrich, measuring from five to seven feet in height; the crown of its head and the back of the neck are clothed with feathers, but the throat is naked, and the plumage, which hangs down like long hair on each side of the body, is of a mixture of brown and gray tints.

The Emeu is abundant in the southern parts of Australia, but it is rapidly becoming extinct in the British Colonies. Its flesh is very good, that of the young birds especially being exceedingly delicate; the eggs, which are of a green colour, are also eaten both by natives and colonists, and the natives of some districts are said to live chiefly upon Emeu's eggs during the breeding season of these birds. Unlike the preceding species, the Emeus pair, but the males, as in the Rhea, hatch the eggs. The young birds exhibit black stripes upon a nearly white ground.

BARTLETT'S EMEU (*Dromaius irroratus*) is a second species very nearly allied to the preceding, the existence of which was long since suspected by Mr. Bartlett, but only recently proved by the importation of specimens into Europe. It is distinguished by its speckled plumage, and inhabits the western parts of Australia, where it would appear to represent the common Emeu.

THE CASSOWARY (*Casuarius galeatus*)—Plate 21, fig. 81. The Cassowaries, resembling the Emeus in having three toes on each foot, are distinguished from them by the inequality of the claws, of which the inner one is much elongated, by the presence of five stiff cylindrical shafts destitute of barbs in each wing, by the position of the nostrils near the middle of the upper mandible, and by their having a large horny casque or helmet on the crown of the head.

The Common Cassowary is generally described as being a native of the Molucca Islands and of New Guinea, but Mr. Sclater states that the only certain locality that he knows for it is the island of Ceram. It is about five feet in height, and its body is clothed with a very long hair-like plumage of a black colour, through which the five bare quills of the wings project; its casque is black, and the naked wattled skin of the head and neck is bright red, tinged here and there with a somewhat livid azure blue. This bird feeds upon fruits, herbage, and seeds; and, like the ostrich, swallows indiscriminately almost anything that comes in its way. It runs very swiftly, and when in danger kicks very severely with its powerful feet. Its eggs are of a grayish-green colour.

THE MOORUK (*Casuarius Bennettii*) was lately described by Mr. Gould from specimens brought alive to Sydney from the island of New Britain, and afterwards presented by Dr. Bennett to the Zoological Gardens in London. It is a smaller bird than the common Cassowary, measuring less than four feet in height to the crown of the head; the casque forms a sort of double crest at the back, the bare skin of the neck is blue, and the wings contain only four spines. The Mooruk runs very rapidly, and possesses an extraordinary power of leaping; it feeds principally on soft vegetable and animal matters, but, like the other birds of this family, will swallow almost anything. The natives of New Britain regard these birds as to a certain degree sacred, and treat them as pets, often carrying them about in their arms.

Three other species of Cassowary are mentioned by Mr. Sclater in the Proceedings of the Zoological Society. These are the CAPE YORK CASSOWARY (*C. australis*), a native of North Australia, which has a "bright red helmet, and blue and scarlet caruncles;" the BICARUNCULATED CASSOWARY (*C. bicarunculatus*), distinguished by having the throat wattles placed far apart; and a species mentioned by Mr. Blyth as living in a menagerie at Calcutta, in which the naked skin and wattles of the neck are yellow. These species are still very imperfectly known.

FAMILY II.—APTERYGIDÆ.

The three remarkable birds, inhabitants of New Zealand, which constitute this family resemble the Emeus in the general form of the body and in the nature of the plumage, but are at once distinguished from those ostrich-like birds by the shortness of their legs and the presence of a short hind toe, armed with a strong claw on each foot. A further distinction is afforded by the form of the bill, which is elongated, nearly cylindrical, and slightly curved; the nostrils are situated quite at the tip of the upper mandible. The wings, as in the Emeu, are rudimentary and completely concealed beneath the feathers of the body.

SHAW'S APTERYX (*Apteryx australis*)—Plate 22, fig. 83—the species first discovered, was described by Dr. Shaw nearly fifty years ago; but for a long time its place in the system was a matter of dispute. It is called the *Kivi-kivi*, in imitation of its cry, by the natives of New Zealand. This curious bird stands about two feet high when most erect; its plumage is of a tolerably dark-brown colour. It runs with great rapidity, and when pursued takes refuge in holes of the rocks, or amongst the roots of a tree, which are also its haunts during the day-time. When seized it defends itself vigorously with its powerful feet. Its activity is nocturnal, and it feeds principally upon earthworms, which it captures by driving its long bill into the soil, first of all, according to some authors, stamping upon the ground as if to ascertain the presence of its prey. These birds live in pairs and construct a rough nest in the holes which they ordinarily frequent; in this the female lays a single egg about the size of that of a goose. Their flesh is much esteemed by the New Zealanders, but a still higher value is placed upon their skins or feathers, which are employed by the chiefs in the manufacture of cloaks.

The other two species are MANTELL'S APTERYX (*A. Mantellii*), and OWEN'S APTERYX (*A. Owenii*).

ORDER VII.—GRALLÆ.

THE name of this order refers to the *stilted* appearance of most of the birds composing it, they being mounted upon long and slender legs which present no small resemblance to stilts, and enable their possessors to wade readily in shallow waters. Hence the birds of this order are often called *Waders*, although this name is by no means applicable to the whole of them, a good many being inhabitants of dry places.

The characters of this order may be shortly given as follows:—The feet are adapted for walking, and furnished with three distinct toes, usually united by a small membrane at the base, and sometimes bordered with membranous lobes, but not completely united as in the swimming birds. The legs, and especially the tarsi, are always rather long, and sometimes much elongated, and the naked scaly skin of the feet is almost always continued for a greater or less distance above the articulation of the tarsus with the tibia. The whole of the naked skin is usually reticulated, but in some species the toes, and even the front of the tarsi, is covered with scutella or plates. The posterior toe is sometimes entirely wanting, and generally but little developed. It varies also in its position, being either placed on the same plane as the anterior toes, or slightly elevated on the back of the tarsus.

To compensate for the great elevation of the legs, the neck is almost always considerably elongated, and, as a general rule, the bill is likewise rather long. By this means the bird, when stalking along upon the ground, or wading in shallow water, is enabled to pick up worms, mollusca, and insects, or to strike with ease and rapidity at passing fishes. The wings are generally well developed, and furnished with long quills.

In habits, as in form, the Grallatorial birds present many diversities. They are generally very active, running and flying with equal ease and celerity. Some, as already mentioned, frequent marshy places and the borders of water, in which they seek their food, whilst others haunt dry sandy heaths, and similar situations. Even amongst the aquatic species we find a great diversity—some wading in the shallow water by means of their long and slender legs; others, which are provided with very elongated toes, running over the floating leaves of aquatic plants; others, again, some of which have their toes bordered with membranous lobes, swimming about and diving with all the ease of the most expert Natatorial birds. Their food, however, nearly always consists of animal substances.

FAMILY I.—OTIDIDÆ.

The first family of this order includes the Bustards, which, as we have already stated, make the nearest approach to the gallinaceous birds, whilst by some ornithologists they have been regarded as forming a part of the order Cursores. They are generally large and rather heavy birds, with a short, stout, compressed bill, exhibiting some resemblance to that of the gallinaceous birds. The nostrils are situated in grooves near the base of the upper mandible, and the basal portion of these grooves is clothed with short feathers; the legs are long and moderately slender; the naked skin of the tibiæ and feet is reticulated; the hinder toe is entirely wanting, and the anterior toes are rather short and stout, with blunt claws at their extremities. The wings are of considerable size. The Bustards are met with in dry places, where they feed chiefly upon worms and insects, with a slight intermixture of green herbage. They run with great rapidity, and are endowed with considerable powers of flight, although they do not rise easily from the ground. They are polygamous in their habits.

THE GREAT BUSTARD (*Otis tarda*)—Plate 22, fig. 84—which was formerly abundant on the heaths and downs in many parts of this country, is now nearly, if not quite extinct in Britain. It occurs in Germany and France, and more or less abundantly throughout Southern Europe, always frequenting the wild and open parts of the country. The male of this fine bird measures nearly four feet in length, and the female about three feet. The general colour of the plumage of the upper surface is buff, with numerous delicate transverse black bars; the lower surface is white, and the head and neck are white with a grayish tinge; from each side of the chin in the male, and also, according to some writers, in the adult female, there springs a tuft of feathers about seven inches in length, which passes backwards beneath the cheek. Bustards were formerly hunted with dogs in this country. On the continent they are now frequently shot with the rifle, and, as they are very shy and wild, the sportsmen often have much difficulty in stalking them. The flesh of the young birds especially is highly esteemed, and on the continent they are often seen in the markets for sale. The Bustard is polygamous, and the females lay two or three eggs in a small hollow in the ground. Its food consists partly of vegetable matters, and, in addition to worms and insects, it is said to kill and devour small quadrupeds and reptiles.

THE LITTLE BUSTARD (*Otis tetrax*), another European species, is much smaller than the preceding, measuring only about seventeen inches in length. The plumage of its upper surface is pale chestnut, delicately marked with transverse undulated black lines; the lower parts of the body, the wing-coverts, and the base of the primary quills are white, and the remainder of the primaries grayish-black. During the breeding season the neck of the male exhibits a bluish-gray tint at its upper part; this is bounded beneath by a narrow collar of black and another of white, and below the latter there is a broader black band, crossed in the middle by a white one.

The little Bustard is generally distributed in Southern Europe, Western Asia, and North Africa. In northern countries it is only a straggler, and the individuals killed in Britain cannot be regarded otherwise than as accidental visitors. As they occur here only in winter, and chiefly in the eastern counties, they probably come to us from the north of Europe. The little Bustard frequents open districts, and has a rapid and powerful flight. Its food consists of herbage, seeds of various kinds, and insects. The eggs are laid upon the ground amongst tall herbage; they vary in number from three to five.

THE HOUBARA BUSTARD (*Eupodotis undulata*), which inhabits Northern Africa, is also met with in Spain. It is considerably smaller than the Great Bustard, which it resembles in general form, but has the legs still more elongated; its general colour is yellowish or buff, delicately mottled with numerous small brown spots; the wing primaries are black with a white spot in the middle; the male is adorned on the head with a crest of long light feathers, and on the sides of the neck with a large ruff of similar plumes. Other species of this group are met with in Africa, India, and Australia; they are all very similar both in appearance and habits.

FAMILY II.—CHARADRIIDÆ.

This family, the best known species of which are the Plovers, includes a considerable assemblage of various forms, some of which exhibit much resemblance to the Bustards both in appearance and habits, whilst others partake more of the characters of some of the genuine wading birds. In these birds the bill is usually shorter than the head, and the basal part of the upper mandible is depressed, soft, and weak, whilst the apical portion is stronger, harder, and more or less arched. The nostrils are situated in long grooves, which extend half the length of the upper mandible. The legs and feet are usually much elongated and slender, with the naked skin extending considerably above the articulation of the tarsus; the anterior toes are but moderately developed, and united at the base by a small membrane; the posterior toe is often wanting, and, when present, attached to the back of the tarsus at some little distance from the ground.

The majority of the birds of this family are inhabitants of the Eastern hemisphere. They are found in all localities, generally in flocks, and some of them frequent fields and pastures at a distance from water, whilst others haunt the margins of rivers and lakes, or even seek their subsistence on the sea-shore. Many of them are migratory birds, passing to high latitudes during the summer for the purpose of breeding.

THE COMMON THICK-KNEE (*Œdicnemus crepitans*)—Plate 22, fig. 85—is one of the species belonging to this family which make the nearest approach to the Bustards. It has long legs, terminated by only three toes, which are united for some distance by a membrane; its nostrils are situated near the middle of the beak, which is depressed and weak at the base, horny and arched towards the apex. It is rather a large species, measuring about seventeen inches in length.

In this country the Thick-knee occurs only in the summer, and is more abundant in the southern and eastern counties of England than elsewhere. It frequents especially the sandy plains of Norfolk, from which circumstance it is frequently called the Norfolk Plover. It is also found in most of the temperate and warmer parts of the Old World. The food of these birds consists chiefly of worms, slugs, and insects, but they are likewise said to devour small mammalia and reptiles. They frequent open districts, heaths, and fallow fields, and the female deposits her two eggs upon the bare ground. These birds appear to be crepuscular or nocturnal in their habits, and their shrill whistling note is often heard at night in the solitary districts which they haunt.

THE CREAM-COLOURED COURSER (*Cursorius gallicus*) is another species closely allied to the Bustards, with which it agrees in its general habits. It is an inhabitant of the northern parts of Africa, and is said to be more abundant in Abyssinia than elsewhere. On the north coast of Africa it is known as a summer visitor from the interior, and a few specimens have been known to extend their migration into Europe, and even as far north as this country. This bird is much smaller than the preceding species, measuring only about ten inches in length. Its general colour is pale buffy-brown above, and buffy-white beneath; the primaries are black, and the head exhibits a white and black streak on each side, meeting behind; the feet are cream colour. Like the rest of its genus the Cream-coloured Courser runs with extreme rapidity. It frequents dry ground.

THE BRAZEN-WINGED COURSER (*Cursorius chalcopterus*)—Plate 23, fig. 86—also called the PURPLE-WINGED COURSER, is a native of Southern and Tropical Africa. It is about the same size as the preceding species, but has a shorter and stouter bill. The general colour of its plumage is an ashy-brown; the head is variegated with white and reddish-brown, and the wing-feathers are adorned with violet spots, margined with a shining green band.

THE COLLARED PRATINCOLE (*Glareola torquata*)—Plate 23, fig. 87. The Pratincoles, all of which are inhabitants of the Eastern hemisphere, are distinguished by the shortness of their bill, which is considerably arched, and has its gape very wide, extending back as far as the eyes, as in the Fissirostral birds. From this peculiarity, coupled with its long, narrow, and pointed wings and forked tail, Linnæus was induced to arrange the species known to him in the same genus with the swallows, although, at the same time, recognizing its relationship to the wading birds.

The Collared Pratincole is an inhabitant of the warmer and temperate parts of Africa, Asia, and Europe, migrating towards the north in the spring, sometimes even as far as England. In its general habits this bird resembles the plovers, frequenting sandy plains and the margins of water, and running with great rapidity. As might be expected, from the form of its wings and tail, it also flies remarkably well, its flight greatly resembling that of a swallow;

and it further resembles those birds in its habit of capturing insects on the wing. Insects and worms constitute its chief food. The eggs are deposited in the midst of a tuft of rushes or other herbage. They are three or four in number. Several other species are met with in Africa, and two or three in India and the neighbouring islands.

THE GRAY PLOVER (*Squatarola helvetica*)—Plate 23, fig. 89—also called the GRAY SANDPIPER, a winter visitor to this country, appears to be distributed over the whole of the northern parts of the Old World, breeding in the arctic regions during the summer, and migrating southwards, as far as Africa and India, for the winter season. It measures about twelve inches in length, and is speckled with black and white above, and black beneath, in the summer; in the winter the plumage is gray above, and paler or white beneath.

THE GOLDEN PLOVER (*Charadrius pluvialis*)—Plate 23, fig. 88—is a permanent resident in Britain, where it is found in considerable numbers on the hills and swampy grounds, especially towards the north. It is widely distributed in the Northern hemisphere, and appears to resort to the regions within the arctic circle in great quantities in the summer to breed. The lower surface is black in summer, and in the winter dusky-white, spotted with yellow. The whole length is about eleven inches. Like the other Plovers, this species associates in considerable flocks, and utters a shrill whistling note. It feeds upon insects, worms, and slugs. The eggs are four in number, and are deposited in a hollow in the ground, amongst the heath, with but little lining. The young birds run as soon as they quit the egg, and the parents make use of many artifices in protecting their helpless family from any enemy.

THE DOTTEREL (*Charadrius morinellus*) is a summer visitor to this country. It is smaller than the preceding species, measuring only nine inches and a half in length; its plumage above is ash colour, variegated with brown and buff; the head is brown, with a white streak on each eye; the breast is fawn colour, with a white transverse band, and the belly black. The Dotterel breeds on the high grounds of the northern parts of England and Scotland, laying three or four eggs in a small hollow in the ground; its food consists of worms, insects, and slugs.

THE RING-PLOVER (*Charadrius hiaticula*), a still smaller species, less than eight inches in length, is a permanent resident in Britain, where it chiefly frequents the flat sandy shores of the sea. It is also met with in the northern parts of Europe and America, advancing to the arctic shores during the summer. The neck and lower surface are white; on each side of the head is a large black spot, and across the lower part of the neck is a broad black band, leaving a distinct white collar round the neck.

THE LAPWING (*Vanellus cristatus*), likewise called the *Peewit*, in imitation of its note, is an abundant species on marshy grounds, heaths, and moors in this country, and also throughout Europe and Asia. This bird frequents marshy ground near the borders of lakes and rivers, and is also found on open heaths, commons, and moors. It deposits its eggs, usually four in number, in a slight depression in the ground; they are in great esteem for the table, and, in those districts where the birds abound, these eggs are carefully sought for and brought to market. When disturbed upon their eggs the parent birds fly or run off, or fly round the intruder, using various stratagems to lure him from the place. The food both of the old and young birds consists, like that of the preceding species, of worms, slugs, and insects; and Latham states that he saw a Lapwing approach a worm-cast, turn it to one side, and then walk two or three times round the hole to give motion to the ground; on the worm making its appearance it was seized by the watchful bird.

The Lapwing is rather more than twelve inches in length. Its head is adorned with a pointed crest of elongated feathers, which the bird can elevate or depress at pleasure; the crown of the head, the face, throat, and upper part of the breast are black; the sides and back of the neck are white, speckled with black; the upper surface is dark-green with a purple and coppery lustre, and the lower surface is white. The tail is white at the base and black at the apex.

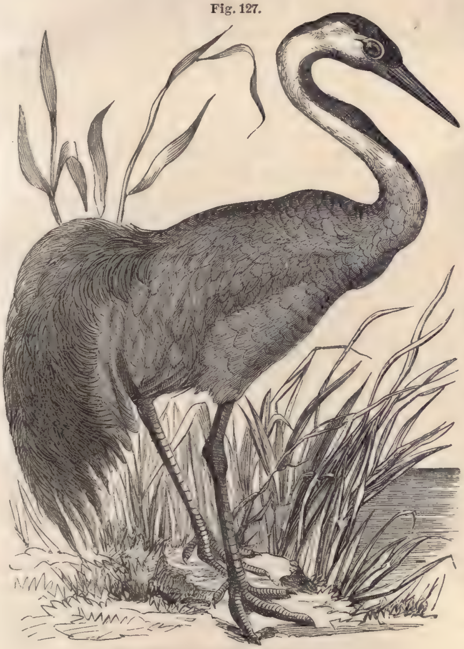
THE OYSTER-CATCHER (*Hæmatopus ostralegus*)—Plate 23, fig. 90—is a British example of a small group consisting of about a dozen species, distributed in all parts of the world. Its most striking peculiarity is the form of the bill, which is much longer than the head, and a little curved upwards, of a pentagonal form at the base, but compressed in the apical portion, so as to constitute a thin blade, terminating in an abruptly truncated extremity. The Oyster-catcher frequents our coasts throughout the year, and also appears to inhabit most of the shores of the northern parts of the Old World. It is likewise met with along the course of rivers. Its food consists principally of small mollusca, which it picks up in abundance on the shores, and its peculiarly constructed bill is said to be of great service to it in opening the shells of the bivalves, and in detaching limpets from the rocks. Its English name is evidently derived from the supposition that it is able even to open oysters with this instrument. The eggs, which are usually four in number, are deposited on the bare ground, and the parents, like the other plovers, endeavour by various wiles to lure away intruders from their nest.

FAMILY III.—GRUIDÆ.

The Cranes, which constitute the types of this family, are large and handsome birds—inhabitants for the most part of the warmer regions of the globe. They have a large and strong bill, which is sometimes straight and pointed, sometimes more or less arched at the extremity; their nostrils are placed in large grooves, and generally near the middle of the upper mandible; their legs are of great length and rather slender, with the tarsi compressed and covered in front with broad shields, and the naked skin continued upwards to a considerable distance on the tibiæ; and their toes are rather long, with the exception of the hinder one, which is small and elevated on the back of the tarsus, so that it does not touch the ground in walking. The two outer anterior toes are united at the base by a very small membrane. The tail in these birds is usually very short, but the wings are broad and strong; and in the true Cranes the tertiaries are greatly developed, forming elegant decomposed plumes, which hang gracefully over the hinder portion of the bird, and often give it a most elegant appearance. The head is frequently adorned with a crest.

THE COMMON CRANE (*Grus cinerea*)—fig. 127—is an inhabitant of Europe, Asia, and Africa, resorting to the warmer regions during the winter, and migrating to the northward in the spring. It is now a very rare and occasional visitor to this country, but in former times appears to have been much more abundant here, as it is frequently mentioned in old household books, and in the descriptions of great feasts. Curiously enough, it usually occurs here in severe winters.

Fig. 127.



The Common Crane (Grus cinerea).

The Crane measures about four feet in length, and the general colour of its plumage is ash-gray. The sides of the head and neck are white, the wing-primaries are black, and the elongated and decomposed tertiaries, which were formerly much in request as ornaments for the head, are variegated and tipped with blue-black. The bird has a long and slender neck, and a long, straight, and pointed bill. In their migrations the Cranes, like the wild geese and swans, fly in a regular body, usually in the form of a wedge, but sometimes in a long extended line. They fly at a great height in the air, and, like the aquatic birds above alluded to, frequently emit their loud and trumpet-like cry, which may be distinctly heard even when the birds are at a great elevation. The trachea, as in the wild swan, is much convoluted, and a great portion of it lies in a cavity of the sternum.

The favourite haunts of the Crane are marshy districts, where it finds in abundance the worms, mollusca, and frogs, which constitute a great part of its nourishment. It does not, however, confine itself to this diet, but feeds freely on grain and the leaves of aquatic plants. Its nest is generally placed amongst the thick reeds, osiers, or luxuriant herbage in the marshes which it frequents, but occasionally upon the top of a ruined building. The female lays only two eggs.

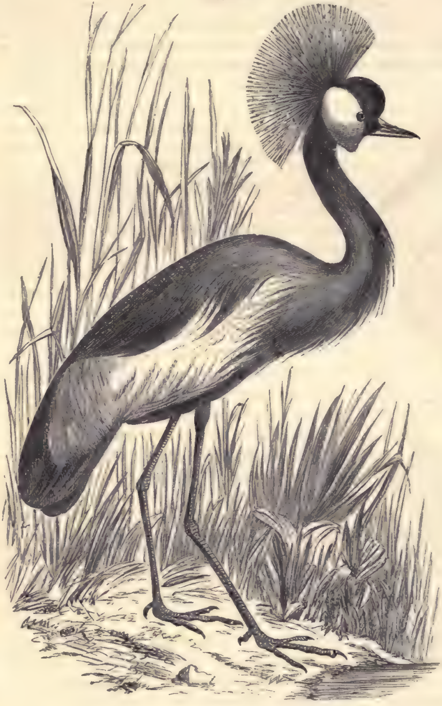
THE DEMOISELLE CRANE (*Anthropoïdes virgo*) has a tuft of elongated feathers on each side of the head, and numerous long slender plumes depending from the base of the neck. The wing-coverts are very long and pointed. This elegant bird is an inhabitant of Northern Africa and South-western Asia, and also occurs, although but sparingly, in Southern Europe. It measures about three feet four inches in length, and is of a bluish-ash colour, with the greater part of the head and the neck black. It is frequently called the Numidian Crane, from its African habitat.

THE CROWNED DEMOISELLE (*Balearica pavonina*)—fig. 128—is another beautiful species, resembling the preceding in general form, but at once distinguishable from it by the presence of a large spreading tuft of stiff reddish-brown fibres, which springs from the back of the head. The sides of the head are naked and red, and there is a kind of wattle on each side of the throat. This graceful bird is an inhabitant of many parts of Africa, and also extends its range to the Mediterranean islands and the south of Europe. With the preceding species it is frequently seen in aviaries.

MARCGRAVE'S CARIAMA (*Cariama cristata*)—Plate 23, fig. 91. Besides the preceding and several other species of true Cranes, most of which are found in the Eastern hemisphere, this family includes some singular American birds, to which the name of *Trumpeters* is often given. These birds have a shorter and more arched bill than the true Cranes, and their tertiary feathers are not elongated or decomposed. Of these, the species known as the Cariama is a large bird about thirty or thirty-two inches in length, of a reddish-gray colour, very finely mottled with brown. The head is adorned with a tuft of straight, decomposed plumes, and the rather long and ample tail is crossed near the tip by a broad black band. The wings are short, and the bird possesses but little power of flight; but its long legs enable it to run with great speed upon the elevated plateaux of South America where it dwells. It haunts the margins of woods and forests, and feeds upon worms, insects, lizards, and small snakes. The Cariama is a wild and shy bird. Its voice is very loud and strong.

THE TRUMPETER (*Psophia crepitans*), also called the AGAMI, another South American species, is especially abundant in Guiana, where it is frequently domesticated and kept in the poultry yards, from a notion that it protects the fowls from the assaults of predaceous birds. It becomes exceedingly tame, and will then follow its owner about like a dog, and even endeavour to drive away other domestic animals to prevent their receiving any notice. The Trumpeter is about the size of our common Heron. It has a short convex bill, long tarsi, and a short tail. Its general colour is black, with a very brilliant metallic blue lustre on the upper surface. The bill is yellowish, and the feet orange colour. The name of this bird is derived from the peculiar loud and rough trumpeting sound which it emits. Its flesh is said to be very delicate. Two other species of Trumpeters are known; one of them (*P. viridis*) is of a green colour above, and the other (*P. leucoptera*) has the wing-quills white.

Fig. 128



The Crowned Demoiselle (Balearica pavonina).

FAMILY IV.—ARDEIDÆ.

This family includes a much greater number and variety of birds than the preceding—the Herons, Bitterns, Storks, Ibises, and many other forms. Of course, in so extensive a family the characters are liable to great variation, but all the birds referred to this group agree in one important point, namely, the full development of the posterior toe, which is placed on the same plane as the three anterior ones, and is applied to the ground in walking. The legs are long and slender, and naked for a considerable distance above the articulation of the tarsus. The latter is generally scutellated. The bill is always of considerable size, and strong; in the majority it is of a conical form, and often very acute at the point. The wings are greatly developed, and the birds are generally endowed with considerable powers of flight, although they are rarely very rapid in their motion through the air. These birds are found in all the warmer and temperate parts of the world, and many of them are either very widely distributed or perform more or less extensive migrations. They haunt marshy places and the margins of lakes and rivers, and feed for the most part upon fishes, frogs, and other aquatic animals.

THE GRAY HERON (*Ardea cinerea*)—Plate 24, fig. 92. This fine bird, which may be taken as the type of the Herons properly so-called, is a native of Britain, where it is tolerably common and generally distributed. It is a large species, measuring fully three feet in length, and is furnished with enormous wings, which, when spread, look quite disproportionate to the size of the bird. The general colour of the plumage is bluish-gray above, and white beneath. The back of the head is adorned with a crest of long dark slate-coloured feathers; the bill is yellow, and the legs greenish.

The common or Gray Heron appears to be generally distributed over the Old World, but in its most northern haunts it is migratory, only visiting them in the summer. At this season the bird frequents inland districts, along the margins of lakes and rivers, in the neighbourhood of marshy places; but in the winter it frequently resorts to the shores of the sea and the mouths of rivers. Its food consists principally of fishes, which it captures by standing patiently in the water until they pass within its reach, when the long neck is immediately darted out, and the luckless prey is generally secured and swallowed. Large fish are sometimes transfixed by one of the acute mandibles; and Mr. Yarrell mentions a case in which a Heron drove its upper mandible through the eyes of a large eel, which then, in its agony, coiled itself so tightly round the neck of its captor that the bird was prevented from breathing, and the pair were found dead in this close but by no means loving embrace. Besides fish, the Heron feeds freely upon frogs, newts, and other aquatic animals, and is said even to devour small birds and quadrupeds.

At the commencement of the breeding season, the Herons, which have lived in solitude through the winter, become very sociable in their habits, and collect together, like the rooks, in some wood or clump of large trees, which is generally frequented by them for many years in succession. Upon these trees they build their broad flat nests, which are composed of sticks and twigs, and lined with wool. The eggs are four or five in number, and of a sea-green colour. The young birds remain in the nest until they are able to fly and provide for themselves—the parents feeding and tending them with great care.

THE PURPLE HERON (*Ardea purpurea*) is generally distributed in the warmer and temperate parts of Europe, Asia, and Africa, and is not a very rare visitor to this country. It has the sides of the neck fawn colour, with black streaks, the back slate colour, the long feathers falling over the wings chestnut, and the lower surface maroon, mixed on the belly with slate colour. It is a fine bird, measuring about thirty inches in length. Unlike our common Heron, this species dwells amongst the reeds and other tall herbage of swamps and marshes, where it also makes its nest.

THE GREAT EGRET (*Ardea Egretta*)—Plate 24, fig. 93—an inhabitant of both North and South America, is a beautiful species of a pure white colour, adorned with a sort of train of long decomposed plumes, descending from the upper part of the back, and falling gracefully over the tail. Including these plumes it measures upwards of four feet in length. In the United States this is a migratory bird, inhabiting the swamps and rice-fields of the southern states. Its nest is built on the cedars in the same way as that of the common Heron, and the birds usually collect in considerable societies during the breeding season.

THE GREAT WHITE HERON (*Ardea alba*), which is also called the GREAT EGRET, and was long supposed to be identical with the last species, is an inhabitant of Europe and of Western Asia, and an accidental visitor to this country. It is smaller than the American species, but closely resembles it in its general characters.

THE LITTLE BITTERN (*Ardetta minuta*) differs from all the preceding species in having the legs clothed with feathers down to the articulation of the tarsus. It is an inhabitant of South-western Asia, the south of Europe, and the whole continent of Africa. It occurs occasionally in Central and Northern Europe, and a good many specimens find their way into England, where they have sometimes been supposed to breed. The Little Bittern is about thirteen inches in length. The general colour of the upper surface is blue-black, but the wing-coverts are buff, as is also the lower surface; the front of the neck is white, and the bill and feet are yellow. This bird frequents marshes and the margins of rivers, where it dwells amongst the osiers and luxuriant herbage. Small fish, frogs, and other aquatic animals, constitute its food. The nest is made upon the ground amongst reeds or dense herbage, and the female lays four or five eggs.

THE GREAT BITTERN (*Botaurus stellaris*)—Plate 24, fig. 94. This bird is widely distributed in almost all parts of the Old World, and in former days was a common species in Britain; but as the fens and marshes have been gradually drained, the Bittern has become more and more scarce, until now it is looked upon as a rare bird in this country. It is a large bird, measuring about thirty inches in length; its legs are long, naked for a short distance above the tarsal articulation, and terminated by four long toes, capable of being widely spread; its bill is hardly so long as in the Herons, but is strong, and acute at the tip. The feathers of the neck are very full and capable of being erected, so as to give the neck the appearance of being of great thickness, when the back of the neck is found to be nearly bare of feathers.

The Bittern resides in fens, morasses, and marshy places, and amongst the dense flags and reeds along the borders of rivers, where in spring its loud, booming, or bellowing note is still frequently heard. Its food consists of almost any animals which it is able to overcome and swallow—such as small mammalia and birds, fishes, frogs, newts, and insects. Entire water-rails have sometimes been found in its stomach. It feeds principally at night, and remains in concealment during the day, when it is not easily driven from its retreat. When forced to rise, its flight is not vigorous; but if wounded it defends itself courageously from both dogs and men, and is able to inflict severe injuries with its sharp and powerful bill. The nest of the Bittern is composed of sticks, reeds, &c., and is placed amongst the thickest parts of the marsh herbage, usually close to the water's edge. The female lays four or five eggs of a pale brown colour; and the young, when hatched, remain in the nest and are carefully tended by their parents until they are able to provide for themselves.

THE NIGHT HERON (*Nycticorax europæus*), which is an inhabitant of the warmer and temperate parts of Europe, Asia, and Africa, is occasionally met with in Britain, principally in the southern counties. It is about two feet in length, and is supported upon rather shorter legs than the preceding species. The back of the head is adorned with some slender variegated white plumes; the top of the head and back of the neck are black; the back is black, with a greenish tinge; and the whole lower surface is white. This bird, like the Bittern, is nocturnal in its habits, and frequents marshes, fens, and the borders of lakes and rivers, where it conceals itself among the rushes, reeds, and other herbage. Unlike the Bittern, however, it builds its nest on a tree. Its food consists of frogs, fishes, and aquatic insects.

THE BOATBILL (*Cancroma cochlearia*)—Plate 24, fig. 95—one of the most remarkable birds of this family, is at once distinguished by the peculiar form of its bill, which is very large and wide, and has the upper mandible deeply and broadly furrowed on each side from the base to the apex, leaving a strong rounded keel in the middle, terminated at the tip by a distinct hook. This bird is about the size of a large fowl; the male has a pendent crest of elongated black feathers on the back of the head; in the female the crest is wanting. The Boatbill is widely distributed in South America, frequenting the borders of the creeks and rivers, in which it seeks the fishes and crustacea which constitute its food. It perches on trees, and in its habits appears to resemble the ordinary Herons.

THE WHITE SPOONBILL (*Platalea leucorodia*) is another species remarkable for the singular form of its bill, which is much depressed, broad at the base, thence gradually narrowed to a little past the middle, and dilated towards the apex into a flat oval plate. Both mandibles take part in this curious formation. The White Spoonbill is a native of Asia, Africa, and Europe, in many places being tolerably abundant; in northern countries, and even in England, it is only an occasional visitor. Its plumage is entirely white, with the exception of a band across the breast which is of a buff colour; the naked skin of the throat is yellow; the back of the head bears a crest of elongated slender feathers; the bill is black, with the extremity yellow; and the legs are black. The length of the full-grown male is about thirty-two inches; the female is rather less, and has a smaller crest. The trachea of the Spoonbill is very curiously convoluted in the form of the figure 8.

The Spoonbill resembles the preceding species in its general habits, frequenting the margins of rivers and lakes, in which it procures the fishes, frogs, aquatic insects, and other animals, which constitute its food. In capturing minute animals at the water's edge or in the mud, it makes use of its wide spoonlike bill much in the same way as a duck. It is an abundant bird in Holland during the summer, but migrates southward at the approach of winter, during which season it haunts the coasts of the Mediterranean in flocks. The nest is generally made amongst the reeds and herbage of the marshes, but in some places the Spoonbill is said to build, like the heron, in trees.

THE ROSEATE SPOONBILL (*Platalea Ajaja*)—Plate 25, fig. 96—a beautiful species of a rose colour with the wings rich carmine, enjoys a wide distribution in South America. In its habits it resembles the European species.

THE WHITE STORK (*Ciconia alba*)—Plate 25, fig. 97. In the Storks and their immediate allies the bill is very strong, conical, and usually pointed; the upper mandible has no grooves, and the nostrils are pierced in its sides near the base of the bill. The White Stork, which is a well-known European bird and an occasional visitor to Britain, is migratory in its habits, passing the summer only in temperate and cold latitudes. It is a large and handsome species, measuring about three feet and a half in length, and is of a white colour, with the extremities of the wings black.

The Stork frequents marshes and the banks of rivers, devouring indiscriminately any aquatic animals that come in its way, and not even sparing the young of water fowl. It also feeds freely upon any offal or carrion; and for this reason in many places its visits are regarded with great favour; and it may be seen stalking about with perfect confidence even in the crowded streets of towns. It often takes up its abode upon the house-tops and there builds its nest, returning every year to take possession of its old dwelling; and in Holland and Germany it is usual for the people to place boxes upon the roofs for the accommodation of the Storks. The nest consists of a mass of sticks and similar rough materials, in the midst of which the female lays three or four eggs; the young, when hatched, are attended with great care by the parent birds, which feed them by introducing their bills into the gaping mouths of their offspring and then disgorging a portion of their last meal. The affection shown by the Stork for its young has indeed become proverbial; and the female has been known to prefer perishing with her young ones in a conflagration to making her escape without them.

THE BLACK STORK (*Ciconia nigra*) is another European species, of which a few specimens have been taken in this country. It inhabits as wide a range of country as the White Stork, and like it is a migratory bird; but instead of approaching the dwellings of man, it takes up its abode in the most sequestered spot it can find. This bird is nearly as large as the White Stork, and is of a deep black colour, with purple, coppery, and green tints, except on the lower surface, from the breast backwards, the plumage of which is white. The bill and feet are orange red.

THE ADJUTANT (*Leptoptilus Argala*), also called the GIGANTIC CRANE, is a large and curious bird, inhabiting India and the Indian islands. It frequently attains a height of five feet, and measures fully half as much more from the tip of the bill to that of the enormously elongated feet. This remarkable bird has a long, powerful, conical bill with an acute tip, with the nostrils in the form of longitudinal slits near the base of the ridge of the upper mandible; its head and neck are nearly bare of feathers; in front of the neck is a large pouch, and the base of the neck is surrounded by a sort of ruff of feathers. The wings are of enormous size and the legs are very long and stilt-like, the naked reticulated skin extending far above the articulation of the tarsus. The Adjutant is of an ashy-gray colour above, with the borders of the elongated wing-coverts white; its lower surface is white. This bird is exceedingly voracious, devouring anything that comes in his way; with his enormous bill he is able to snap up even such large articles of food as fowls, cats, and rabbits, and the capacity of his throat is such that he swallows these whole. A small leg of mutton will also disappear in the same way, and where the Adjutant is kept in a tame state, it requires no little care to protect provisions of all kinds from his sudden attacks. He is nevertheless regarded as a benefactor by the inhabitants of the countries in which he occurs, on account of the quantities of carrion which he devours, and for this reason his presence in the towns is even encouraged. In a wild state this bird lives in flocks, generally frequenting the flat shores of the mouths of rivers.

THE MARABOU STORK (*Leptoptilus Marabou*) is an African species, a little smaller than the preceding, which it resembles in its form and general habits. This bird is chiefly remarkable for the great delicacy of the feathers growing from beneath the wings, which are known as Marabout feathers, and form some of the most admired ornaments of ladies' head dresses.

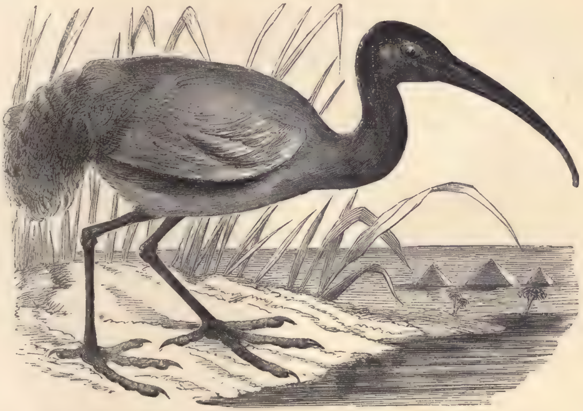
THE SENEGAL JABIRU (*Mycteria senegalensis*)—Plate 25, fig. 98—is an inhabitant of the same region as the last species, to which it is nearly equal in size. It is at once distinguishable from all the preceding forms of this group by the peculiar form of the bill, which is curved upwards at the tip. In its habits this bird resembles the Storks. A nearly allied species, the *M. australis*—is an inhabitant of Australia; and a third, distinguished by having the bill black and the head and neck nearly naked (*M. americana*), is met with in the tropical regions of South America.

THE MADAGASCAR OPEN-BILL (*Anastomus lamelligerus*—Plate 26, fig. 99—is also a species of the group of Storks, but is distinguished from all the preceding forms by the curious conformation of its bill. This organ is long and stout, as in the other Storks, and the mandibles are in apposition for the basal half of their length; but from this point to near the tip they are separated by a small interval, the tips again coming in contact. The edges of the open part of the bill are furnished with numerous lamellæ, or little plates. This bird, which is found in Southern Africa and Madagascar, is about the size of the common Stork, which it resembles in its habits. Another species (*A. oscitans*) inhabits the continent of India.

THE TUFTED UMBRE (*Scopus umbretta*)—Plate 26, fig. 100. This remarkable species, which is an inhabitant of Africa, is about the size of a crow, and of a brown colour; the male has the back of the head adorned with a large crest. The bill is much compressed, and its upper mandible is furrowed along the sides and terminated by a curved or slightly hooked tip.

THE BALÆNICEPS (*Balæniceps rex*). This singular bird, which is an inhabitant of Nubia and the banks of the White Nile, was described about ten years ago by Mr. Gould, who regarded it as in some respects allied to the Pelicans. It was placed by Mr. Gray amongst the Herons and in the neighbourhood of the Boatbill, with which curious bird it has some analogy in the form of its bill; but Professor Reinhardt of Copenhagen, in a paper recently published, contends, and apparently with good reason, that the Balæniceps is most nearly allied to the Umbre, also an African bird, with which it would form a small subordinate group, standing in the immediate vicinity of the Storks. The Balæniceps is a large and powerful bird, measuring about four feet and a half in length; its head is large and bears a broad, somewhat depressed bill, of which the upper mandible is spoon-shaped, but terminated by a strong hook. It stands upon a pair of long slender legs, of which the naked reticulated part extends for a considerable distance above the tarsal joints.

Fig. 129.



The Sacred Ibis (Geronticus æthiopicus).

THE SACRED IBIS (*Geronticus æthiopicus*)—fig. 129. The group of birds to which the common name of *Ibis* is given, is distinguished from the other forms of the present family by the slender and elongated form of the bill, which is obtuse at the tip and gently curved downwards. The Sacred Ibis, which is an inhabitant of many parts of Africa, was regarded with great veneration by the ancient Egyptians, who kept many of these birds in the courts of their temples, and frequently embalmed their bodies after death. The Ibis is also constantly to be found represented on the sculptured monuments of Egypt. It is about the size of a large fowl, and its plumage is white, with the exception of the tips of the wings, which are black; the head and greater part of the neck are nearly naked and black, and the bill and feet are black.

THE MILKY IBIS (*Tantalus lacteus*)—Plate 26, fig. 101—belongs to a genus in which the bill is stouter than in that including the Sacred Ibis, but in which the head and part of the neck are still bare of feathers. This bird is an inhabitant of Java.

THE AFRICAN TANTALUS (*Tantalus Ibis*), which was long supposed to be the Sacred Ibis of the Egyptians, is found chiefly in the tropical parts of Africa, especially on the western coast. It resembles the last species, but has the naked skin of the face red.

THE SCARLET IBIS (*Ibis rubra*) is a beautiful species of a bright scarlet colour, with the tip of the wings black, which inhabits the marshes bordering the great rivers of South America, and is described as one of the chief ornaments of those regions. It has only a small portion of the head naked.

THE GLOSSY IBIS (*Ibis falcinellus*), which is nearly allied to the last species, appears to be distributed over nearly all parts of the known world. It is occasionally seen in this country, and even finds its way as far north as Sweden. In ancient Egypt this bird shared with the Sacred Ibis in the veneration of the people; it is seen represented on their monuments, and its mummies have been found in the tombs.

The Glossy Ibis is about two feet in length, and the plumage of its upper parts is of a dark-reddish or chestnut-brown colour, with beautiful purplish and bronzed green tints. The lower surface and neck are dark reddish-brown, the bill is purplish-brown, and the feet are green. Like many other species of the Ibis group it is migratory; it lives chiefly in swampy places by the sides of rivers and lakes, and feeds on young frogs, small fishes, insects, worms, and mollusca.

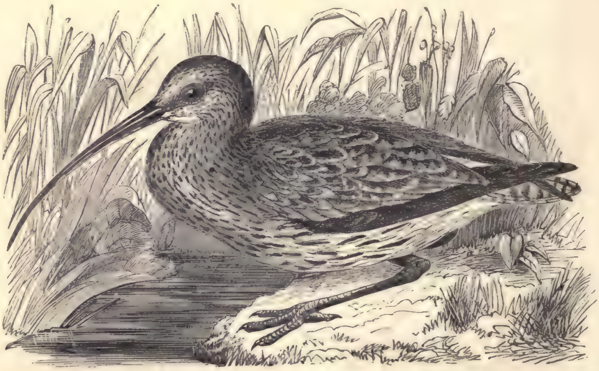
FAMILY V.—SCOLOPACIDÆ.

These birds, which are among the smaller species of their order, are distinguished by their long, slender, and nearly cylindrical bills, which are obtuse at the tip and generally somewhat flexible, of a softer texture than in most birds, and often covered at the tip with a delicate skin, abundantly supplied with nerves, and thus forming an admirable tactile organ. The upper mandible is a little longer than the lower one and usually grooved on each side; the nostrils, which are small, are pierced at the base of the bill in the grooves. In the development of the legs the birds of this family differ considerably amongst themselves—some having the legs longer and more slender in proportion to their size than any other birds, whilst others are supported upon comparatively short limbs. The anterior toes are of moderate length, and frequently connected at the base by membranes; the posterior toe when present is small and slightly elevated, but sometimes entirely wanting. The wings are well developed, and the birds generally possess considerable powers of flight.

The species of this family, which are exceedingly numerous, are all true wading birds, frequenting marshy places and the banks of rivers, in the mud and soft ground of which they seek the worms and insects which constitute their chief food.

THE CURLEW (*Numenius arquata*)—fig. 130—a common British species, is one of the largest birds in this family, the female measuring upwards of two feet in length, whilst the male is a few inches less. It is of a brown colour, with the edges of the feathers whitish, and the rump white; the lower surface is white or nearly so, with the breast pale brown, and the neck and breast streaked with dark brown. The bill, which is long and considerably curved downwards, is brown, and the naked part of the long slender legs is pale blue.

Fig. 130.



The Curlew (Numenius arquata).

During the late autumn and winter the Curlew frequents the sea-shore, where it finds an abundance of small crustacea, worms, and other marine animals; but at the approach of spring it migrates inland, and usually in a northerly direction, to breed upon the moors and hills. The nest consists of a few dry leaves and similar materials brought together in a tuft of herbage, and in this the eggs, four in number, are laid. They are of a pear-shape, and are generally placed with the smaller ends together. Our common Curlew is generally distributed in all parts of the Old World.

THE BLACK-TAILED GODWIT (*Limosa melanura*) is a bird of passage in this country, appearing with us chiefly in the spring and autumn on its way to and from its northern breeding-places, although a few pairs remain through the summer and breed in our fens and marshes. It is met with throughout the northern half of the eastern hemisphere. This bird measures from sixteen to seventeen inches in length; it has a long bill, very slightly curved upwards. Its plumage varies greatly with the seasons; but it is always distinguishable by its black tail.

THE COMMON REDSHANK (*Totanus Calidris*) is a not uncommon British species, and resides in this country throughout the year. It is also met with on the continent of Europe, in most parts of Asia, and in Northern Africa. The female is about eleven inches in length. In its winter plumage the upper surface is ashy-brown, with the primaries nearly black, the rump white and the tail barred with gray; the lower surface is white, with a few dusky streaks. In summer the back and especially the wings are spotted with brownish-black, and the lower surface is streaked and spotted with black. The bill is dark-red with the tip black, and the feet are red. During the winter the Redshanks are seen in flocks on the sea-shore, seeking small marine animals by probing with their bills into the wet sand and mud; for the breeding season they resort to inland marshes, moors, and heaths. The nest is composed of a little coarse grass. Like many other wading birds the Redshank swims with facility.

THE COMMON SANDPIPER (*Totanus hypoleucus*) is a summer visitor to this country, arriving in April and taking its departure again in September. It is also known as the SUMMER SNIPE. It is about seven inches and a half in length; its colour above is greenish-brown, with a blackish bar on each feather; the primaries are nearly black; the breast is a pale-ash colour streaked with black, and the rest of the lower surface pure white. This is a lively and active little bird, which frequents the margins of our rivers, lakes, and ponds, where it runs nimbly along on the gravel and mud, seeking for worms and insects. It is rarely seen on the coast. Its nest is composed of a little moss and a few dry leaves in the immediate vicinity of water; generally in a hole of the bank under the shelter of a tuft of rushes or grass, or at the root of a tree. The eggs are four in number. This species swims well, and even the young birds before they are able to fly will take to the water when threatened with any danger. They can even dive with facility and remain under water for a considerable time, coming up at a distance from the place where they went down; they are said to progress under water by the agency of their wings.

THE GREENSHANK (*Totanus Glottis*) is another migratory species, which makes its appearance with us chiefly in the spring and autumn on its journey to and from the high northern latitudes in which it prefers to breed. Some specimens, however, remain with us through the summer, especially in the northern parts of Scotland. It is of an ashy-brown colour above, with the edges of most of the feathers buffy-white; the primaries are black and the tail white, barred or striped with brown; and the lower surface is white, with the neck and breast, and the sides under the wings, marked with ash-coloured streaks. The bill is black and the feet olive-green. This bird occurs in Europe, Asia, and North America, and generally in the vicinity of the coasts.

THE AVOCET (*Recurvirostra Avocetta*)—Plate 27, fig. 102—is remarkable for the length of its legs and for the singular form of its bill, which is long, slender, and strongly curved upwards. It measures about eighteen inches in length, and its plumage is curiously pied with black and white. The toes are united by large membranes, but it does not appear to use its feet in swimming, as is done by some species not so well provided. The Avocet inhabits Asia and Africa, and visits Europe as a bird of passage; it is rare in this country, but appears to have been more abundant formerly. It is sometimes seen on the coast, but more frequently in marshy places on the borders of water in the interior, it walks about on the soft sand or mud, or wades deeply into the water, poking about with its long, flexible, and curiously formed bill in search of the worms, aquatic insects, and small crustaceans on which it feeds. The nest is made in a small hole in the ground, and the bird is said to lay only two eggs.

THE STILT (*Himantopus melanopterus*), also called the LONG-LEGGED PLOVER, is especially remarkable for the immense length of its slender legs, which appear quite out of proportion to its little body. It is nearly allied to the Avocet, but has a straight bill; and the posterior toe, which is small in the Avocet, is in the present bird entirely wanting. The back and wings are nearly black, with a slight green tinge; the remainder of the plumage is white, the bill is black, and the feet are pink. The length of the bird is about thirteen inches. This species is found in Europe, Africa, and Asia; it is a rare visitor to this country.

THE AMERICAN STILT (*Himantopus nigricollis*), a bird very nearly allied to the last species, but distinguished from it by its black head and neck, is found on the Atlantic coasts of North America in company with the American Avocet. During the breeding season it associates in small parties of six or eight pairs, which make their nests, at a short distance apart, amongst the thick tufts of grass on the dry ground near the salt marshes frequented by them. The nests are composed of dry grass, twigs, and similar materials, and as the birds sit they continually add to the height of their nests, probably with a view to protect the eggs or young from any accidental rising of the water above its ordinary level. Several other species of Stilts are known; they are scattered over all parts of the world.

THE RUFF (*Philomachus pugnax*). The male of this species is adorned during the breeding season with a large quantity of feathers, springing from the head and throat and forming a large ruff, which is capable of being raised or depressed at the pleasure of the bird, hence its ordinary English name. The females, which are called *Reeves*, are destitute of this ornament. This bird is rather more than ten inches in length; the feathers of the upper surface are black, broadly margined with ash-colour and brown; those of the neck and breast are still more broadly edged with grayish-white, and the remainder of the lower surface is white.

The Ruff inhabits most parts of Europe in the summer, but is most common towards the north; it is also found in Asia and Northern Africa, and performs a regular migration in spring and autumn. In this country it is met with in the fen districts, where it breeds, but is much less common here than formerly. It is polygamous in its habits, and the males fight with the greatest ferocity and determination.

THE KNOT (*Tringa Canutus*), unlike the preceding species, is a winter visitor to this country, where it is not an uncommon bird from autumn to spring. It does not appear ever to breed in any part of the British islands, but resorts to very high northern latitudes for this purpose. Like a good many other birds which have this habit, it is common to both hemispheres, of which it seems to inhabit all the northern parts. The Knot is about ten inches in length, and in the summer its upper plumage is black, with the feathers margined with reddish-brown and white, and the whole lower surface rich reddish-chestnut, in the winter it is ashy-gray above, and white streaked with gray beneath. In this country the Knot is met with on the shores, chiefly of the southern and eastern counties.

THE DUNLIN (*Tringa variabilis*), which is about eight inches in length, undergoes changes in its plumage analogous to those occurring in the preceding species, and the difference between the bird in its summer and in its winter dress is so great, that it was long supposed to form two species, distinguished under the names of the *Dunlin* and the *Purre*. The Dunlin is diffused over the whole northern hemisphere, and migrates to high latitudes in the spring to breed; in this country it is abundant on the sea-coasts during the autumn and winter, but appears to breed only in the most northern parts of Scotland, and in the Orkney and Shetland islands. It frequents flat sandy shores, where it is seen in constant activity, running along or taking short flights near the edge of the water, and continually probing with its bill in search of the small crustacea on which it chiefly feeds.

THE COMMON SNIPE (*Scolopax gallinago*)—Plate 27, fig. 103.—This well-known bird, although generally migratory in its habits, and breeding in high northern latitudes, is still truly indigenous to this country, in all parts of which it is known to breed, but most commonly towards the north. It is, however, most abundant here during the winter, when it is met with in marshy places all over the country. The bill in the Snipe, and in all its immediate allies, is thickened, soft, and very tender at the extremity, and this part, being richly supplied with nerves, serves as a delicate organ of touch in searching in the soft ground for the insects and worms which constitute the food of the bird. The nest of the Snipe is a very slight structure, composed of a little dry grass or other herbage, brought together in a small hollow in the ground, often under the shelter or in the midst of a tuft of grass or rushes. The eggs are from two to four in number. The Common Snipe is found in all parts of Europe, and in Northern Africa and Asia Minor, but in its more southern places of residence it is only a winter visitor.

THE JACK SNIPE (*Scolopax gallinula*), a smaller and rarer British species than the preceding, is found in this country almost exclusively during the winter, although a few specimens remain to breed in the northern parts of Scotland. It is widely distributed over the eastern hemisphere towards the north, and migrates into high latitudes every summer.

THE GREAT SNIPE (*Scolopax major*) is a larger species, measuring about twelve inches in length. Like the preceding Snipes it is widely distributed, and migrates far north to breed.

THE WOODCOCK (*Scolopax rusticola*), which, like the Snipes previously referred to, is a winter resident in this country, is also known to remain here through the summer, and to breed in many parts of Britain, especially in the north of Scotland. It arrives here early in October, and leaves us again for the north in March, and during its residence here dwells chiefly in plantations and copses in the vicinity of water. It feeds at night, when it sallies forth from its cover and proceeds silently to its feeding ground, where it seeks the worms and larvæ of insects which constitute its nourishment. In its mode of nidification it resembles the other Snipes.

THE GRAY PHALAROPE (*Phalaropus lobatus*).—The Phalaropes closely resemble the Snipes in their general characters, but are at once distinguishable by the structure of their feet, which have the anterior toes bordered with membranous lobes, rendering them efficient swimming organs. Hence, they have been placed by some ornithologists in the same group with the Coots and Grebes, in which nearly the same structure of foot prevails, although in all other respects the Phalaropes are evidently true members of the Snipe family.

The Gray Phalarope is a pretty little bird, measuring about eight inches in length. In winter its colour is pearl-gray above, with the greater part of the wing-feathers lead-gray, margined with white; the lower surface is white. In the summer it is nearly black above, with the margins of the feathers pale-yellow, and reddish-chestnut beneath. This bird is widely distributed in the Northern hemisphere, being met with in Europe, Asia, and North America. It is migratory in its habits, resorting to the extreme north for the breeding season, and passing the winter in the warmer temperate latitudes. It is usually seen in this country in autumn, when it is not uncommon, and a few specimens remain with us through the winter. As might be expected, from the structure of its feet, the Phalarope is a good swimmer. It has been seen several miles out at sea, swimming about and capturing the small crustacea and other animals which float at the surface of the water. When swimming its appearance resembles that of a teal. Two other species of Phalaropes are met with in North America, one of which, the **RED-NECKED PHALAROPE** (*P. hyperboreus*), is also found in Europe.

FAMILY VI.—RALLIDÆ.

In this family the bill is always short, much compressed, and wedge-shaped; the upper mandible is grooved along each side, and the nostrils are generally placed near the middle of the bill. The legs are also short, rarely so long as in the preceding family. They are generally pretty stout. The toes, especially the anterior ones, are greatly elongated; the hinder toe is sometimes of moderate length, sometimes very long, and it is either placed on the same plane with the anterior toes, or elevated a little upon the back of the tarsus. The claws with which the toes are armed are often very long, especially that of the hinder toe; and the birds in which this structure occurs are thereby enabled to run with ease upon the floating leaves of aquatic plants. The wings are moderate, and the tail generally short. The neck, also, is short, and in their general aspect the birds resemble the Gallinæ more than the true Waders.

In their habits the birds of this family vary greatly. Some of them frequent dry places, and especially corn-fields, whilst others haunt marshy places and the margins of water. Of the latter, some, as already stated, run over the floating aquatic plants, and others swim and dive with ease. Their food consists of worms, small mollusca, and insects, but they also eat a good deal of vegetable matter. We may commence with those forms which are represented in Britain.

THE WATER-RAIL (*Rallus aquaticus*)—Plate 28, fig. 106—is an abundant species in many parts of Europe, but does not occur very commonly in England, where, however, it is a constant resident. In the north of Europe it is a summer visitor. This bird frequents marshes, where it dwells amongst the dense beds of reeds, rushes, and other herbage. Through these the compressed form of its body, which, indeed, is common to all the species of this family, enables it to pass with great facility, so that it can hardly be driven from its cover by any means. It is also able to swim and dive well. The nest consists of a mass of sedges and coarse grass, collected amongst the thickest herbage of its haunts. The appearance of the Water-rail is well shown in our figure. Its bill is longer than in most other species of the family, and the whole length of the bird is nearly a foot.

THE LAND-RAIL (*Crex pratensis*), which is also called the CORN-CRAKE, is a common visitor to Britain, arriving here towards the end of April. It resembles the Water-rail in its general appearance, but is nearly two inches shorter, and has a much shorter bill. The Land-rail is abundant all over Europe, and also visits Northern Africa in the winter. It haunts damp meadows and the borders of rivers, and is also commonly found in corn-fields, from which its curious cry of *crek, crek, crek,* may be constantly heard in the dusk of the evening. The food of this bird consists of worms, slugs, insects, and even small reptiles, and its flesh is regarded as exceedingly good. Its nest, which is placed on the ground in a field of thick grass, clover, or corn, is composed of dried herbage, and usually contains from seven to ten eggs. The female sits very close; indeed, an instance is recorded of her head being cut off by mowers. When in danger, and unable to escape, the Land-rail will feign death in the most perfect manner, and persist in this simulation until it gets an opportunity to steal away. Several other Crakes or Land-rails are met with in this country. They all visit us in the summer. Other species are dispersed in all parts of the world.

THE GALLINULE (*Gallinula chloropus*)—Plate 28, fig. 108.—The Gallinules are distinguished from the preceding species by having the ridge of the upper mandible dilated at the base into the form of an oblong plate, of rather soft consistence, which covers more or less of the forehead. They are all aquatic in their habits. The hinder toe is more developed than in the preceding species of this family. The common Gallinule, Moor-hen, or Water-hen of this country is generally distributed over the Old World, always inhabiting marshy places. The Gallinule swims and dives with great facility, and is rarely seen except on the water, along which it moves with a nodding motion of the head, probably corresponding to the strokes given by the feet. It picks up most of its food while thus swimming about, and obtains some also by diving to the bottom of the water, but in the morning and evening not unfrequently wanders to the damp meadows in its vicinity in search of worms, insects, and slugs. Occasionally this bird perches on the branch of a tree, and it has even been known to place its nest upon a branch hanging close to the surface of the water; but the nest is generally made on the ground amongst reeds and other herbage. The eggs are usually seven or eight in number, and the birds produce two or three broods in the season. In winter the Gallinules frequent running water, which is not liable to be frozen over, and in severe winters they take to hedge rows and plantations, and appear to feed on berries and seeds.

THE COOT (*Fulica atra*), which is very nearly allied to the Gallinule, is distinguished from it by the broad membranous lobes with which the toes are bordered on each side The base of the upper mandible is dilated into a frontal plate. The Coot is considerably larger than the Gallinule, measuring about sixteen inches in length; its colour is a sooty black, with the tips of the secondaries white, forming a narrow band across the wing; the bill is flesh colour, with its frontal dilatation white, and the feet are dark green. This bird is widely distributed in Europe and Asia, and performs a partial migration towards the north in the summer. It frequents large open sheets of water, and is very watchful in its habits; for which reason other water fowl are said to be exceedingly fond of associating with it. It swims and dives well, and is active and lively on land; it even perches and moves about the branches of trees with great ease.

THE SULTANA BIRD (*Porphyrio pulverulentus*)—Plate 28, fig. 107.—The species of the genus *Porphyrio* are very nearly related to the Gallinules, which they resemble in most of their characters. They are distributed over most parts of the world, principally in the warmer regions; only one species, and this a native of Africa, occurs in Europe. In their habits they resemble the Gallinules. The species figured is a native of Southern Africa, where it is met with on the banks of rivers.

THE JACANA (*Parra Jacana*).—The Jacanas differ from the preceding species in the form of the bill, which is more or less arched towards the tip, and in the great length and acuteness of the claws, especially those of the hinder toes. The wings also are armed with spurs at the bend. The claw of the hind toe is perhaps more elongated in the present species than in any other. It is an inhabitant of Brazil, where it frequents the rivers, and runs by means of its elongated toes over the floating leaves of the aquatic plants. At the base of the bill there is a large dilated plate standing up in front of the forehead, and a sort of wattle-like prominence occupies the base of the lower mandible; the head and lower surface are black, and the upper parts chestnut. Its length is about ten inches.

THE CHINESE JACANA (*Parra sinensis*)—Plate 27, fig. 104—is an example of a different group of these birds, which some ornithologists have elevated into a genus, under the name of *Hydrophasianus*. It is destitute of the frontal plate at the base of the upper mandible. Several other species are found in America, Africa, and Southern Asia.

THE HORNED SCREAMER (*Palamedea cornuta*)—Plate 28, fig. 105—is nearly allied to the Jacanas. Its head is decorated with a singular long and slender horn, and its wings are armed each with two spurs. The toes, and especially the claws, are comparatively shorter than in the true Jacanas. This bird is about the size of a goose, and of a blackish colour, with a large red spot on each shoulder. It dwells in the marshes of South America, living in pairs, and utters loud cries which may be heard at a great distance. It is said to live chiefly upon leaves and seeds.

THE CHAJA (*Chauna chavaria*), instead of the curious horn of the Screamer, has on the back of the head a circle of feathers, which are capable of being raised or depressed at the pleasure of the bird. The Chaja is an inhabitant of Brazil and Paraguay; it feeds chiefly on vegetable matters, and is frequently kept with the domestic poultry, as it is said to drive away birds of prey. This bird is remarkable for the looseness of its skin, which appears to be separated from the subjacent muscles by a stratum of air-cells, and the skin crackles when the finger is pressed upon it.

ORDER VIII.—NATATORES.

IN the Natatorial or Swimming Birds we find in its highest state of development a character which, as already stated, occurs more or less amongst the members of the preceding order, namely, the union of the anterior toes by a web or membrane. In fact, in most of these birds the feet are completely palmated, the membranes extending quite down to the extremities of the toes; but this is not universally the case, for in some forms the toes are merely bordered with a wide membrane. The posterior toe is almost always small, more or less elevated on the back of the tarsus, and directed a little inwards; in a few species it attains a greater degree of development, and is then united by a membrane to the inner anterior toe. By the agency of these webbed feet the birds of this order are enabled to swim with great ease and rapidity, and most of them pass the greater portion of their existence upon the surface of the water, not a few also being able to dive and progress beneath the surface with astonishing facility. The legs are usually rather short, and placed very far back towards the tail, a position which, coupled with the boat-like form of the body, greatly increases the natatorial power, but renders the gait of these birds upon dry land awkward and waddling in the extreme. In some forms, such as the Penguins and skeleton, the legs are so placed that the bird is compelled to hold itself quite upright when out of the water.

The body, as already indicated, is of an elongated, boat-like form, admirably adapted for speedy motion through the water; it is generally stout and bulky, and most frequently terminates in front in a rather elongated and very flexible neck. The plumage is dense, and exhibits a very thick under-coat of down; the outer surface is kept constantly greased by the birds, so that the water runs off it with great readiness. In other respects these birds exhibit many and important differences amongst themselves. In the development of the wings we find a far greater variation than in any other order of birds, some species being endowed with enormous organs of flight, which suffice to support them in the air for the whole day without apparent fatigue; whilst others have mere rudimentary pinions, quite unfitted for flight. The latter are the most thoroughly aquatic in their habits of the members of the order; and between these two extremes we find every intermediate grade. The bill is also subject to great variations in size, form, and texture.

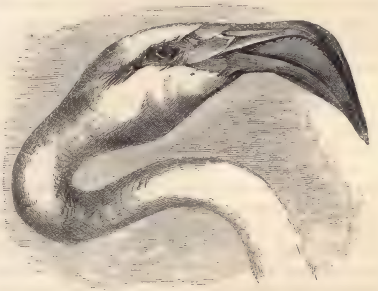
As might be expected from the preceding statements, the habits of these birds vary greatly, and they form six well-defined families, presenting important differences both in structure and mode of life.

FAMILY I.—ANATIDÆ.

The birds forming this family, of which our common Geese and Ducks are characteristic examples, are easily distinguished from all the rest of their order by the peculiar characters presented by the bill. This organ is generally of a rather broad and flattened form, and furnished with a soft covering; and the edges of both mandibles exhibit a series of fine, tooth-like lamellæ or plates. The office of these, which interlock when the mandibles are nearly closed, is to form a sort of strainer, by means of which the birds are enabled to separate small particles of food from the water and mud in which they commonly seek their nourishment. The feet are well developed, and the anterior toes are united by ample membranes; the hinder toe is small, free, and raised more or less on the back of the tarsus. The wings are also tolerably large and powerful, enabling the birds, notwithstanding their bulky and rather heavy bodies, to fly with considerable ease and rapidity; many of them are migratory in their habits, and perform long journeys to and from their breeding places. They are generally gregarious, and most of them frequent fresh waters, although they are often seen on the sea-shore in the winter season. Their food consists chiefly of worms, aquatic insects, and mollusca, which they obtain as above described by straining the mud and water through the fine lamellæ of their bills. The species of this family are very numerous, and we can only refer to a few of the most interesting forms.

THE FLAMINGO (*Phœnicopterus ruber*)—Plate 29, fig. 109.—This singular bird undoubtedly presents the nearest approach in many respects to the preceding order, although its characters distinctly show that it belongs to the present family. It is supported upon enormously long legs, of which the naked part extends far above the articulation of the tarsus, as in the Wading birds, with which it was, on this account, long associated by ornithologists; but the feet are fully webbed, it presents the same lamellated structure of the edges of the bill which prevails amongst the Anatidæ, and its plumage possesses all the characters of that of these birds. The bill itself is of a singular form, but is wonderfully well adapted to the peculiar mode of life of this bird—fig. 131. As the Flamingo stalks along upon its long stilt-like legs, or wades in the shallow waters, it holds down its long neck towards the ground, and the peculiarly formed upper mandible is thus turned back downwards, and constitutes a receptacle for any small objects in the mud or water. These are retained by the lamellæ of the mandibles, assisted by the spines which fringe the fleshy tongue, and the Flamingo is thus enabled to retain the small fishes, mollusca, and crustacea which constitute its food.

Fig. 131.



Head of Flamingo.

The Flamingo is an inhabitant of Southern Europe, Africa, and Asia. It is a large bird, old males often standing nearly five feet in height, and as it is gregarious in its habits, collecting in large flocks upon the sea-coast, its bright red wings give these parties a close resemblance to bodies of soldiers standing in line. The nest of this bird is very curious, being a small hill of mud, with a cavity in its summit; in this the female lays two or three eggs, which she hatches by sitting astride upon the hillock. Other nearly allied species are found in both hemispheres.

THE WILD GOOSE (*Anser ferus*)—Plate 29, fig. 110—also known as the GRAY-LAG GOOSE, is believed to be the original stock of our domestic geese, though another species, the White-fronted Goose, is also probably one of their progenitors. It is a migratory bird, inhabiting most parts of Europe and Asia, frequenting high northern latitudes in the summer for the purpose of breeding, and descending to the warm and temperate regions in the autumn. It was formerly not uncommon in this country in the winter, but of late years has become rare.

THE BEAN GOOSE (*Anser segetum*) is the most abundant of our British species; and although chiefly resident here only in the winter, a few pairs are known to remain in Britain through the summer to breed, especially in the north of Scotland. It is found all over Europe, and breeds in the extreme north of that continent. Its name of Bean Goose is given to it from its fondness for pulse and grain; it is known to frequent corn-fields often in great flocks, which do considerable damage. In its migrations this bird, and many of its allies, usually fly at a great height in the air, and in the form of a wedge, or rather of the letter V, with the point directed forward; they generally fly by night, when their passage is betrayed by the clanging sound of their voices.

THE WHITE-FRONTED GOOSE (*Anser albifrons*), a rather smaller species than either of the preceding, is distinguished by having a white band at the base of the upper mandible, continued in the form of a patch on the forehead; it is an inhabitant of the whole northern hemisphere, and is an abundant winter visitor to this country. Its note somewhat resembles a laugh; and hence it has sometimes been called the Laughing Goose.

THE BRENT GOOSE (*Anser Bernicla*), the smallest British species, has a white spot on each side of the neck. It is very abundant here during the winter, but, unlike the preceding species, dwells chiefly upon the coast, feeding upon sea-weeds of various kinds.

THE NEW HOLLAND GOOSE (*Cereopsis Novæ Hollandiæ*)—Plate 29, fig. 111.—Of the numerous other species of Geese distributed in all parts of the world, our space will only permit us to refer to the curious Australian bird, to which the name of *Cereopsis* has been given. In this bird the base of the upper mandible is occupied by a large cere, towards the front of which the nostrils are pierced; the tarsi are rather elongated, and the webs uniting the toes are deeply cut out in a semicircular form. It is about the size of our Common Goose, and is of a gray colour, with the quills of the wings and tail blackish; the bill is black, the cere yellow, the tarsi reddish-orange, and the feet black. The Cereopsis frequents the shores of Australia. Its voice is very strong and clanging.

THE WILD SWAN (*Cygnus ferus*), called the WHOOPING SWAN, in allusion to the whooping cry of the male, is a winter visitor to this country, its summer residence and breeding place being in the high northern latitudes of the Old World. In the Orkneys, however, a few pairs generally remain through the summer and breed. The Whooping Swan is about the same size as the ordinary Tame Swan and, like it, is of a white colour; but the bill is yellow, with the extremity black, while in the Tame Swan the black is at the base of the bill. In this country the Wild Swans frequent the rivers and lakes, and in severe winters move down to the sea-shore. As in the cranes and several other birds which have a loud and trumpet-like voice, the trachea of the Wild Swan is very long, and is bent back into a large fold or loop, enclosed in the interior of the breast-bone.

THE TAME SWAN (*Cygnus olor*), or MUTE SWAN, so called from his possessing only a soft and rather musical voice, very different from the strong notes of the preceding species, is the well-known and graceful species so often seen adorning with its delicate white plumage, and elegant form, the surfaces of our lakes, rivers, and ornamental waters. It is the only species that permanently resides in this country, where, however, it is generally met with in a half-domesticated condition. This bird has the extreme tip of the upper mandible and its edges, and a patch at the base of the bill extending to the eye, and occupying a large tubercle in front of the forehead, black; the rest of the bill is orange-yellow. During the breeding season the swans live in pairs, each pair keeping to its own part of the water, and at this time the male becomes exceedingly fierce, attacking any animal that intrudes upon his domains. The nest is formed of a mass of reeds, rushes, and other plants, and is placed close to the edge of the water, or amongst the plants growing upon some small bank which is hardly above the surface. The eggs are six or seven in number. When hatched the young birds accompany their parents into the water, and occasionally the mother will even take her family upon her back and swim along with them, apparently with the view of relieving them from the necessity of making way against the stream. The whole family remains together throughout the winter, and in the summer or autumn the owners of the swans put a particular mark upon the bills of the young birds, produced by those belonging to them. Many of these marks are very curious; representations of a considerable number, with interesting historical details, will be found in Mr. Yarrell's "History of British Birds."

THE BLACK SWAN (*Cygnus atratus*).—Amongst the species of Swans none is more remarkable than the Black Swan, from the complete exception which it makes to the ordinarily white colour of these birds. This species, which is an inhabitant of various parts of New Holland, and has even given its name to the colony of Swan River in Western Australia, is of a black colour, with the exception of the wing-quills, which are white, and the lower part of the belly, which is of an ash colour. The bill is orange red, and the feet are brownish. The Black Swan is nearly as large as the common species, but appears to be rather inferior to it in strength.

THE WILD DUCK (*Anas Boschas*), of which the male is known as the Mallard, is an abundant species in this country, and was formerly much more numerous here, before the fens and marshes were so generally drained. A few pairs remain here through the summer; but the majority resort to high northern latitudes to breed, and visit us in large flocks at the approach of winter. The Wild Duck frequents marshy places and the borders of rivers and lakes, where it finds an abundant supply of nourishment in the form of worms, insects, and mollusca, except in very severe winters, when it is forced to resort to estuaries in search of food and open water. In a wild state it always pairs; but the domestic ducks, which are derived from this species, are polygamous in their habits.

As the flesh of the Wild Duck is exceedingly good, it is captured in great quantities during the winter season, sometimes by means of the gun, and sometimes by peculiar traps known as decoys. These consist of long-curved canals, leading out of a piece of water much frequented by water-fowl, and covered with nets supported upon hoops. The birds are enticed or driven into these canals by means of decoy ducks, trained to come to a whistle, and assisted by equally well-trained spaniels. The fowlers are concealed by means of reed-screens, so disposed that they may be seen by the birds which have advanced beyond them into the decoy, and which are thus caused to give up all thoughts of retreat; they consequently push forward to avoid the dog and his master, until they reach the termination of the canal, which gradually grows narrower, and ends in what is called a tunnel net capable of being detached from the main net of the decoy as soon as it is filled with birds. These are then taken out and killed by the fowlers.

THE SHIELDRAKE (*Tadorna Vulpanser*) is a well-known species on the British coasts, where it resides throughout the year, but is most abundant in the winter. It is an exceedingly handsome bird, having the head and upper part of the neck deep green, the lower part of the neck white, and below this a broad annular band of chestnut; the back and lower surface are white, the latter with a dark-brown band along the middle; the scapulars and part of the tertials are black, and the primaries dark brown. The bill is of a vermilion colour. The length of the bird is rather more than two feet. On some parts of our coast the Shieldrakes regularly breed in the rabbit burrows, whence they are known as Burrow Ducks.

THE SHOVELLER (*Spatula clypeata*), another British species, is an inhabitant of the northern parts of both hemispheres, breeding chiefly in the extreme north. It is easily distinguished by the great width of the extremity of the bill, from which its names of Shoveller and Broad-bill are derived; the upper mandible is terminated with a rather strongly-hooked nail. This bird inhabits inland marshes, lakes, and rivers, seeking its animal food in the mud and shallow water. It also feeds to a considerable extent upon grass and other vegetable matters.

THE PINTAIL DUCK (*Dafila acuta*) resembles the preceding species in its wide distribution, and is a winter visitor to Britain. The male has the central tail-feathers much elongated and black. In its habits it resembles the shoveller. It is frequently taken with the common wild duck and other allied species in the decoys, and its flesh is in high esteem.

THE TEAL (*Querquedula Crecca*) is one of the smallest species of ducks, measuring only fourteen inches in length. It is found all over the northern parts of the Eastern hemisphere, but does not extend its range to America, where its place is taken by another species. In this country it is a winter visitor, although a few pairs remain here to breed.

THE WIDGEON (*Mareca penelope*), another well-known British duck, is a winter visitor to our islands.

THE POCHARD (*Aythya ferina*).—Besides the preceding ducks, which are chiefly inhabitants of the fresh waters, there is a considerable number of nearly-allied species, which haunt the sea-shore, and may be regarded as marine ducks. Of these the Pochard, which is one of the best known, is found both inland and on the coast. The Pochard measures nearly twenty inches in length; it has the head and neck chestnut-red, the lower part of the neck and the breast deep black, and the rest of the plumage freckled with delicate gray spots and lines upon a white ground. The eye is red. This bird is a winter visitor to this country, and breeds in the extreme northern parts of both hemispheres. Its flesh, when it feeds in fresh waters, is exceedingly good; but specimens killed on the sea-shore are coarse, and of a bad flavour. The Canvas-backed Duck (*A. Valisneria*) of North America, a nearly-allied species, is noted for the goodness of its flesh.

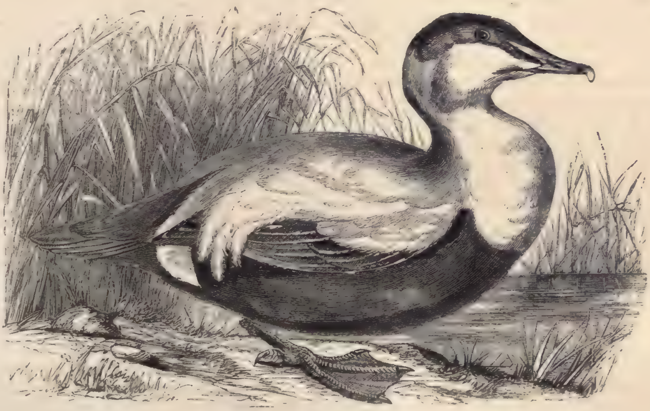
THE TUFTED DUCK (*Fuligula cristata*) is another abundant and well-known British species, which chiefly frequents the sea-coast. It occurs all over the northern parts of the Old World. This is a short and stout-bodied bird, with a small crest on the back of the head; the male has the head and neck and the back black, and the lower surface white, whilst the female is dark brown above and grayish white beneath. Its length is about seventeen inches.

Of other allied species we may mention the HARLEQUIN DUCK (*Fuligula histrionica*), the SCAUP DUCK (*F. marila*), the GOLDEN-EYE (*F. clangula*), the BUFFEL-HEADED DUCK (*F. albeola*), and the LONG-TAILED DUCK (*Harelda glacialis*), all of which visit our shores for the winter season.

THE EIDER DUCK (*Somateria mollissima*)—fig. 132—an inhabitant of some parts of the British coasts, especially towards the north of Scotland, is most abundant in the extreme north of both hemispheres, where it breeds amongst the rocks of the coasts in vast quantities. The male of this species has the cheeks white, the top of the head black, the back of the head green, the back and smaller wing-feathers white, the primaries and secondaries and the great wing-coverts black, the lower surface and tail black, and the neck white, with its lower part pale buff; the bill is dusky green, with its tip white, and the feet are green. The length is rather more than two feet. The female is pale brown, variegated with spots of a darker brown.

The Eider Duck frequents the sea-coast and feeds upon marine animals. It is highly valued on account of the great quantity of very fine, soft, and elastic down which it produces, and which is most abundant in the breeding season, at which period the female plucks this delicate substance from her skin, and employs it as a lining for her nest. The down is collected from the nests by the inhabitants of countries where Eider Ducks abound; and as the female continues to lay and to pull the down from her body for a considerable time when thus plundered, it is said that she will furnish as much as half a pound of this material in the course of the season. It is much esteemed for its warmth and lightness, and is employed in the manufacture of quilts and similar articles.

Fig. 132.



The Eider Duck (Somateria mollissima).

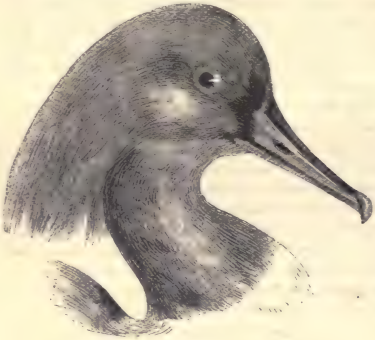
THE COMMON SCOTER (*Oidemia nigra*) is entirely of a black colour, with only the ridge of the upper mandible orange; the female is paler and blackish-brown. Its length is about nineteen inches. This bird is a winter visitor to our coasts, and feeds upon mussels and other bivalve mollusca, which it procures by diving, an exercise in which this and all the marine ducks are very expert.

THE LOBATED DUCK (*Hydrobates lobatus*), a native of Southern Australia, is remarkable for the singular leathery flap which hangs down beneath the lower mandible in the male. The plumage of this bird is of a blackish colour, crossed by numerous paler lines. It measures about thirty inches in length.

THE GOOSANDER (*Mergus Merganser*)—fig. 133. Besides the preceding forms, which all possess a broad and more or less depressed bill, the present family includes a considerable number of species in which that organ is nearly cylindrical, or even compressed, with the upper mandible terminated by a strongly-hooked nail. These birds frequent both inland waters and the sea-shore, and are chiefly confined to the northern parts of the world. They are exceedingly active in the water, swimming and diving with astonishing ease and rapidity in pursuit of the fishes and other animals which constitute their food.

The Goosander, which is one of the largest species of this peculiar form, is a common bird in the northern regions of both hemispheres; in this country it is usually seen only in the winter, although some individuals remain to breed in the northern parts of Scotland. It frequents indifferently the fresh and salt waters, but in severe winters is usually driven to take up its abode in deep bays, where its great power of diving enables it to procure a supply of food.

Fig. 133.



Head of Goosander.

THE RED-BREASTED MERGANSER (*Mergus serrator*) is another species which may be regarded as, to a certain extent, permanently resident in Britain, although chiefly a winter visitor; and the Hooded Merganser (*M. cucullatus*), distinguished by its broad crest, with a large white patch on each side of it, is a native of North America, of which, however, specimens have found their way to our shores.

Family II.—COLYMBIDÆ.

The birds known as Divers and Grebes, which constitute this family, are readily distinguished from those just described, by the absence of the lamellæ along the edges of the bill, which is rather elongated, of a conical form, and acutely pointed. The nostrils are small and very narrow, forming mere slits in the sides of the upper mandible; the wings are short, and the legs are placed so far back, and attached to the body in such a manner, that the birds are compelled to sit upright, resting upon the whole length of the tarsus when on dry ground. The feet are large, and the toes sometimes fully webbed, sometimes bordered by ample but distinct membranes; the posterior toe is always present, although small.

These birds, which are essentially aquatic in their habits, never venturing to move far from the water's edge, are found principally in the northern hemisphere. Some of them frequent fresh waters, others prefer the sea-coast; they fly with considerable rapidity, but only for short distances. They swim and dive with the greatest ease, and progress under water with the most astonishing rapidity, their movements when submerged being greatly aided by the action of the wings. Their food consists of fishes, mollusca, insects, and crustacea.

THE GREAT NORTHERN DIVER (*Colymbus glacialis*), the largest species of this group, measuring nearly three feet in length, is met with chiefly in the arctic regions of both hemispheres, but advances further south at the approach of winter, when it occurs in great abundance about the shores of the northern parts of Scotland. At this period it lives principally on the sea, capturing herrings, sprats, and other small fish by diving; but in the summer these birds frequent the numerous fresh-water lakes of the extreme north, on the margins of which they make their large flat nests of dry herbage. On land the Diver is very awkward, as it is compelled to rest upon its lower surface, and push itself on with its feet; but in the water it moves with surprising rapidity, its speed equalling that of a four-oared boat; and even under water it moves with undiminished swiftness, coming up at intervals for the sake of air, but often remaining below the surface for six or seven minutes at a time. Two other species, the Black-throated Diver (*C. arcticus*) and the Red-throated Diver (*C. septentrionalis*), which correspond with the Great Northern Diver in their distribution and habits, are sufficiently distinguished by the peculiarities indicated in their names. They are both met with on the British coasts, the latter abundantly, the former more rarely.

THE GREAT CRESTED GREBE (*Podiceps cristatus*).—The Grebes are distinguished from the Divers by the peculiar structure of their feet, in which the membranes, instead of uniting the toes, are cleft nearly to the base of the latter, forming broad membranous margins. In other respects, the two forms are very similar, as also in their habits, although the Grebes frequent lakes and other pieces of fresh water in preference to the sea. The Great Crested Grebe, one of the largest species, measures from twenty-one to twenty-two inches in length, and has the plumage of the upper surface dark brown, and that of the lower parts white; the wings exhibit a white patch formed by the secondary quills; the top of the head is dark brown, and is adorned at the back with a double crest of the same colour; the cheeks are white, and below the head there is a sort of tippet, hanging down all round the neck, of a pale chestnut colour, deep chestnut at the lower margin.

This bird is an inhabitant of most of the northern parts of both hemispheres. In this country it is a constant resident, frequenting the lakes and other extensive pieces of water. It feeds upon aquatic animals of all kinds, which its great natatorial powers enable it to capture with ease.

THE HORNED GREBE (*Podiceps cornutus*), also known as the Sclavonian Grebe, is a much smaller species than the preceding one, which it resembles in its general habits and distribution, but is a rare bird in this country in summer. The male is distinguished by the peculiar tufts of feathers which spring from the back and sides of the head.

THE LITTLE GREBE (*Podiceps minor*), also called the DABCHICK, and in some places the DIDAPPER, is the smallest British species of this family, and is by no means uncommon in this country throughout the year. It is widely distributed in the northern parts of the Old World, but is not found in America. The Little Grebe measures only nine inches and a half in length, and is nearly black above, and grayish-white beneath, with the cheeks and upper part of the neck reddish-chestnut. It frequents rushy lakes and ponds during the summer, but in winter resorts to small streams, and when the weather is severe even to estuaries and sheltered parts of the sea-coast. Its food consists of small fishes, insects, and other aquatic animals; and its nest, which contains from four to six eggs, is of large size, and placed amongst the reeds and rushes which fringe its place of abode.

THE SENEGAL COOT-GREBE (*Podica senegalensis*) is nearly allied to the true Grebes, but differs from them in having a well-developed tail, in the greater length of the legs, and in having the posterior toe larger, placed nearly on the same plane as the anterior toes, and bordered by a membrane. Its neck is also much elongated. This bird, presenting a curious combination of characters, has frequently been placed with the Coots in the preceding order. It is a native of Western Africa.

FAMILY III.—ALCIDÆ.

In this family, which includes the Auks, Puffins, and Penguins, the wings are still smaller than in the preceding group, frequently quite incapable of raising their owners into the air, and in some cases even reduced to a nearly rudimentary condition, and covered only with a scaly skin. In all cases, however, these organs are of service to the birds when swimming beneath the surface of the water, an occupation in which much of their lives is passed. The legs in these birds are placed quite at the hinder extremity of the body, so that when on shore they are under the necessity of sitting upright, and supporting themselves on the whole lower surface of the tarsus, which forms a sort of sole, and the hinder toe is either entirely wanting or quite rudimentary. The anterior toes are well developed and united by ample membranes.

The Alcidæ are distributed in most parts of the world, but are most abundant in high northern and southern latitudes. They are found upon the barren rocky shores of the arctic and antarctic lands and islands, often in flocks consisting of vast numbers of individuals; they pass the greater part of their time in the sea, which furnishes them with an abundant supply of the fishes on which they chiefly prey.

THE COMMON GUILLEMOT (*Uria Troile*), which is likewise called the FOOLISH GUILLEMOT, is one of the most abundant and best known British species of this family, and at the same time one of those which approaches in its characters most nearly to the Divers and Grebes. In common with the other Guillemots, it has the wings sufficiently developed to enable it to fly, and the bill is elongated and conical; its colour is a sooty black on the back and wings, except the tips of the secondaries, which are white; the upper part of the throat is also black, but the rest of the lower surface is pure white. The length of the bird is about eighteen inches.

The Common Guillemot is abundant round our coasts at all seasons, and breeds in thousands upon the ledges of the cliffs in many places. It makes no nest, but lays a single egg upon the bare rock, and the female sits upon the egg in an upright position. The young, when hatched, remain for a time upon the ledge of rock, but when arrived at a certain age, the old birds are said to take their offspring on their backs, and fly with them down into the sea.

THE RINGED GUILLEMOT (*Uria lacrymans*) and the BLACK GUILLEMOT (*Uria Grylle*) are also common European and British species; the former closely resembles the Common Guillemot, but has a white ring surrounding each eye, and giving off a narrow line, which runs backwards on the head; and the latter is of a black colour, with a large white patch upon each wing. The Black Guillemot is also abundant on the arctic shores of America.

THE PUFFIN (*Fratercula arctica*), also called the SEA-PARROT and COULTERNEB in allusion to the form of its bill, is a summer visitor to our shores, on some parts of which it breeds in vast numbers. The female deposits her single egg, sometimes in the fissures of the cliffs, sometimes in burrows which she excavates in soft ground to a depth of about three feet, and sometimes in rabbit burrows, the possession of which she disputes with the rightful owners. On land the Puffin is a very awkward bird; but it flies swiftly, and swims and dives well.

THE RAZOR-BILL (*Utamania torda*) is another species remarkable for the singular form of its bill, which is considerably longer than that of the Puffin, but very much compressed and much arched towards the point. The bill is black, with three grooves and a white line; the upper surface and wings are black, with a narrow streak running from the base of the bill to each eye, and the tips of the secondaries and tertiaries white; the whole lower surface is pure white, and the feet are nearly black. The length of the adult bird is about seventeen inches. The habits of the Razor-bill closely resemble those of the Guillemots; it is most abundant in the arctic seas, but occurs more or less on all the European coasts.

THE LITTLE AUK (*Mergulus Alle*).—In this bird the bill is shorter and thicker than in the Guillemots, and the general form of the body is short and stout. It is a small species, less than nine inches in length; the head and throat and all the upper surface are black, with a small spot over each eye, and the tips of the secondaries and tertiaries white; the lower surface is white, the bill black, and the feet yellowish-brown. In winter the throat is white. The Little Auk is found abundantly in the arctic seas, and occurs not uncommonly round the British coasts in winter.

THE GREAT AUK (*Alca impennis*).—This bird, which is nearly, if not quite extinct, is a native of the arctic seas, and was formerly met with occasionally upon the northern shores of Britain. It is a large bird, measuring about thirty-two inches in length; the wings, although furnished with ordinary feathers, are far too small to support its bulky body in the air; and its bill is large, strong, much compressed, and marked with several furrows on each side. In its habits the Great Auk closely resembles the Guillemots. Formerly it occurred not uncommonly about the shores of Iceland, Greenland, and the Faroe Islands, and the eastern coast of North America, as far down as Labrador and Newfoundland, but for many years it has scarcely ever been seen in any of these localities, and in some of them it is certainly extinct. Examples of it are so rare in collections, that a good specimen is now worth fifty guineas, and even the egg will fetch from twenty to thirty pounds.

THE PATAGONIAN PENGUIN (*Aptenodytes patagonica*).—The birds which we have just been describing are found with some allied forms in the extreme northern seas; the Penguins, which constitute the remainder of this family, are equally peculiar to those approaching the antarctic circle. They are distinguished by the rudimentary state of the wings, which are not only far too small to support the birds in the air, but are even destitute of the ordinary quills, the skin of these parts being covered only with scales, which represent rudimentary feathers. These curious organs serve as paddles to assist the birds in swimming beneath the surface of the water; they are also sometimes used as a second pair of feet to aid them in their movements on shore.

The Patagonian Penguin is a large species, standing nearly three feet in height when in an erect position; its colouring is shown by our figure. It is found in large flocks about the coasts of Patagonia and the islands scattered over the antarctic ocean. On shore it is seen in compact bodies, the young birds, moulting birds, and sitting females keeping in distinct parties; each female lays only a single egg, which she hatches by holding it between her legs, and when disturbed, waddles away with her treasure secured in the same manner. At this period the male goes to sea to fish, and brings a supply of food to the female, and the latter, from her sedentary life becomes very fat. The young birds are also fed on shore for some time.

THE CAPE PENGUIN (*Spheniscus demersus*), which is found about the Cape of Good Hope, and also on the shores of the Falkland islands, is nearly the size of a goose, and is black above and white beneath, with a black line on the breast. It occurs in immense numbers, and breeds among the rocks.

THE JACKASS PENGUIN (*Eudyptes demersa*) is very generally distributed in the antarctic seas, and occurs in many places in vast quantities. It is about the size of a large duck, black above and white beneath, with the back of the head adorned with a pair of tufts of a white or yellow colour. The name of Jackass Penguin given to this bird is an allusion to the peculiar braying sound which it emits when on shore; its note when at sea is deep and solemn. This bird makes use of its little wings as fore-legs when moving on the land, and is described by Mr. Darwin as advancing so rapidly in this way among the tussocks of grass, that it might easily be mistaken for a quadruped.

FAMILY IV.—PROCELLARIDÆ.

Whilst the birds of the preceding family are very scantily furnished with wings, and some of them totally incapable of flight, those to which we have now to advert possess large wings, and fly with great ease and rapidity. They have a tolerably stout body, supported upon moderately long legs, which are placed less backward than in any of the preceding groups, so that these birds walk with more grace than most of their allies. The anterior toes are well developed and united by large webs, but the posterior toe is rudimentary or entirely wanting. The structure of the bill serves to distinguish these birds from those of the following family, which they resemble in general form. The apical portion of both mandibles is distinctly separated from the basal part, and the upper surface of the base of the upper mandible is usually occupied by a pair of tubes, generally united together, at the extremity of which are the openings of the nostrils. The nostrils are always of a tubular form.

These birds are strictly oceanic in their habits, passing nearly their whole time upon the surface of the sea, and even apparently delighting in rough weather. Few of them ever visit the shore except for the purpose of breeding, when they deposit their eggs, and hatch and bring up their young upon the ledges of the rocks. Their food consists of fishes and other marine animals, together with fragments of animal matter which they find floating on the waves.

THE GREAT SHEARWATER (*Puffinus major*), a very abundant species in the North American seas, is also seen upon the British coasts, especially on the Atlantic side. It has a long and rather slender, dark-brown bill, and the upper surface ashy-gray, with the back of the neck nearly white, and the primaries and tail-feathers blackish; the whole lower surface is white, variegated with brown about the vent, and the feet are brownish-yellow. The length of this bird is eighteen inches.

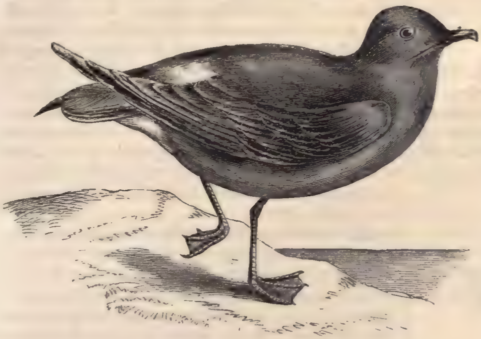
THE MANKS SHEARWATER (*Puffinus Anglorum*) is a smaller species, only fourteen inches in length, and of a brownish-black colour above. It resides all the year in the British seas, especially along our western coasts, and occurs on most of the shores of Europe and on those of North America. This bird breeds in crevices amongst the rocks and in rabbit burrows, laying a single egg. It goes out to sea in the evening during the breeding season, both sexes passing the day in their burrow, where they are heard crooning over a sort of guttural song. Like many other species of this family, this bird when caught in the hand emits a large quantity of a green oily matter of a most abominable odour.

THE GREAT BLACK PETREL (*Puffinus æquinoctialis*)—A considerable number of birds nearly allied to the preceding are met with in the Southern seas, extending even to the Antarctic ocean. One of these is the Great Black Petrel, which inhabits various parts of the Pacific ocean, and is found on the shores of New Zealand and

Australia, and at the Cape of Good Hope. It is a rather large species, about eighteen inches in length, and of a sooty-black colour, with the throat white.

THE STORMY PETREL (*Procellaria pelagica*)—fig. 134—is the smallest species of the present order, measuring less than six inches in length. It is of a sooty-black colour, with the outer margins of the tertiary quills, the upper tail-coverts, and the sides of the vent white. The bill and feet are black. This bird is found in all parts of the European seas, and wanders about all over the Atlantic ocean, depending, however, upon its long, pointed, and powerful wings for its rapid movements from place to place. Even in stormy weather the Petrels, notwithstanding their small size, are very active, flying along over the surface of the waves, with their feet close to, or dipping in the water; indeed, the sailors believe that it is principally at the approach of a storm that these birds make their appearance, and they are known amongst mariners by the names of Devil's birds and Mother Carey's chickens. The name of Petrel is supposed to be a diminutive of Peter, and to be given to the birds in allusion to their apparently walking on the surface of the water, as the apostle did on the lake of Gennesareth. The food of the Petrels consists of small fishes, crustacea, mollusca, and other marine animals; and they will also follow ships for considerable distances in order to pick up any fragments of food that may be thrown overboard. This bird breeds amongst the stones and débris of rocks on our coasts, generally on small islands, and the female lays only a single egg. Upon this she sits so closely, that she may readily be taken by hand; when thus treated, she vomits a quantity of oil, which is collected for burning in many places. Many other species of these birds, all of small size, occur in various seas; three of them are met round the British coasts.

Fig. 134



The Stormy Petrel (Procellaria pelagica).

THE GIANT PETREL (*Ossifragus giganteus*), an inhabitant of the Great Southern ocean, is a truly gigantic species, when compared with the diminutive birds just mentioned, being about twenty-eight inches in length. Its plumage is blackish-gray above, and paler gray beneath, with the head and neck dirty white.

THE CAPE PETREL (*Daption capensis*) measures thirteen inches in length, and has the upper surface speckled with black and white, and the lower parts white. From its spleckled plumage it is sometimes called the Pintado Petrel, and it is well known to sailors under the name of the Cape Pigeon. This bird is met with abundantly at the Cape of Good Hope and also in other parts of the Great Southern ocean.

THE FULMAR (*Fulmarus glacialis*), a British species, very nearly allied to the preceding, is most abundant in the arctic seas of both hemispheres, where it satisfies its voracious appetite by devouring anything that comes in its way on the surface of the water. During the summer it is a constant companion of the whale-fishers, when they are engaged in cutting the blubber off their captures; any fragments which fall into the water during this operation, are immediately snapped up by the watchful birds. Their squabbling on these occasions is said to be very amusing. The Fulmar breeds on rocky coasts, selecting the ledges of lofty and inaccessible precipices for this purpose. It lays a single egg either in a rude nest, or in a depression in the turf clothing the ledge, and so numerous are the birds in some localities, that the whole face of the cliffs seems to be covered with them. The eggs are taken in great numbers by the inhabitants of the vicinity, who esteem them highly as an article of food; and both the old and young birds when seized emit a quantity of clear amber-coloured oil, which is collected like that of the Petrel above mentioned. The young birds also are very fat, and are boiled down in great quantities for the sake of the oil they furnish.

THE BROAD-BILLED PETREL (*Prion vittatus*).—This bird, with a few nearly-allied species, is an inhabitant of the Southern ocean, in many parts of which it is met with abundantly. It is distinguished by the broad and depressed form of the bill, but in its habits appears to resemble the preceding species.

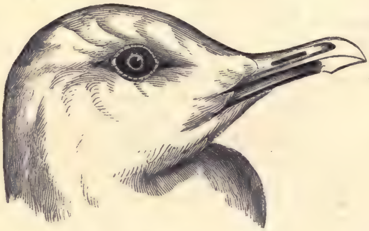
THE WANDERING ALBATROSS (*Diomedea exulans*).—The Albatrosses, of which several species are met with in the Pacific and Southern oceans, are distinguished from the preceding birds of this family by the position of the nostrils, which form a pair of short tubes, projecting from the sides of the upper mandible near its base. They are all large birds, and strictly oceanic in their habits, scarcely ever approaching the shores, except in the breeding season.

The present species is the largest, and is known to the sailors by the names of the Cape Sheep, and the Man-of-war bird. It is an inhabitant of the Southern ocean generally, and flies almost incessantly over the surface of that stormy sea, supported upon its ample and apparently untirable pinions, which in large specimens cover a space of fully fifteen feet. In this way the Albatross passes rapidly along just above the surface of the waves, and ready at any moment to plunge down upon the passing fishes, of which its voracious appetite leads it to consume immense quantities. Its courage, however, is not equal to its size and strength; and the sea-eagles and even the larger gulls will attack it boldly and compel it to give up its prey. It is said sometimes to attack sailors who fall overboard, and is frequently captured by means of a hook baited with a piece of meat, and trailed along at the stern of a ship. The eggs of this bird and its allies, which are of a large size, are deposited upon the rocky and desolate islands scattered over the ocean which they frequent; they are said to be exceedingly good, and, like the young birds, are eaten by the sealers and whalers.

FAMILY V.—LARIDÆ.

In this family, of which our common Gulls furnish well-known and characteristic examples, the wings are well developed, and the birds possess a great power of flight. The bill is variable in its form, but generally rather elongated and compressed, not furnished with a distinct tip as in the preceding family, and the nostrils form linear or oval slits in the sides of the upper mandible without any trace of tubular structure—fig. 135. The feet, which are placed moderately forward, so as to enable the birds to walk with ease, are generally small; the three anterior toes are long and united by a complete membrane, and the hinder toe is small and elevated on the back of the tarsus.

Fig. 135.



Head of Common Gull.

These birds are generally distributed and numerous in most parts of the world, but are most abundant in the Northern and Southern seas. They fly well, and float very lightly and buoyantly upon the surface of the waves, but do not swim much, and are incapable of those remarkable diving exercises which compensate so many of the short-winged species for the imperfection of their power of flight. They are generally noisy, screaming birds, which live together in considerable flocks, and breed in company upon the ledges of precipitous rocks; their food consists chiefly of fishes, which they capture by dashing down into the water as they skim lightly and swiftly above its surface; but they by no means confine themselves to this diet, and many of them feed freely even upon carrion.

THE COMMON GULL (*Larus canus*), one of the most abundant of the British species of this family, occurs also in most parts of Europe and in North America. It is about eighteen inches in length, and is of a pearl-gray colour above; the head and neck and lower surface are white; the secondaries and tertials are tipped with white, and the primaries are black on the outer webs, with a white patch near the tips of the first and second. The bill is greenish-gray, becoming yellow towards the tip, and the feet are of a dark-greenish colour.

This bird is common on most parts of our coasts throughout the year, but is more abundant in some places than in others. It may be seen walking about upon the shore or sand-banks engaged in picking up any portions of food left by the tide, or taking short flights over the shallow water, to seize upon small fishes and other floating objects. It may also frequently be seen in some districts at a distance of several miles from the sea, following the ploughs in order to pick up the insects and grubs; and it is by no means uncommon for it to advance many miles along the course of a tidal river. The Common Gull breeds on the ledge of a cliff, wherever the coast presents such conveniences; on flat shores, it breeds in the marshes, or on low sandy islands. The nest is rather large, and is composed of sea-weeds and grass; the female lays two or three eggs.

THE GREAT BLACK-BACKED GULL (*Larus marinus*) is a constant inhabitant of our coasts, although by no means so numerous as the species just described. It is a large bird, measuring as much as thirty inches in length, and is very predacious in its habits, destroying not only fish, which may be looked upon as its natural prey, but also small birds and even weakly lambs.

THE LESSER BLACK-BACKED GULL (*Larus fuscus*) closely resembles the preceding species in its general appearance, but is less than two feet in length. It is an abundant species about the British coasts, and is widely distributed over the seas of the Old World. This species always breeds on the ledges of rocks, making a nest of grass, in which the female lays two or three eggs. The old birds are very bold in defence of their eggs and young, dashing towards any intruder, to frighten him from the vicinity of the nest, and sometimes actually striking him with their bills. In other respects the habits of this bird resemble those of the preceding species.

THE HERRING GULL (*Larus argentatus*), an abundant and widely-distributed species in both hemispheres, is a little larger than the last species, with which it associates most amicably, usually breeding in the same locality. It has the head, neck, and lower surface pure white, and the back and wings delicate French gray; the tertials are tipped with white, and the primaries are black, with small white spots at the extremities of the first three. The bill is yellow, with the apex of the lower mandible red, and the feet are flesh colour. The Herring Gull receives its name from its partiality to small fish, in pursuit of which it approaches the boats of the fishermen with great boldness.

THE LITTLE GULL (*Larus minutus*) is the smallest species of this family, measuring little more than ten inches in length. It has the head and upper part of the neck black; the lower part of the neck white; the upper surface pale ashy-gray, with the primaries darker, and tipped with white; and the lower surface white. The Little Gull is rather a rare bird in this country, but is more common in Southern Europe. It is said to feed upon insects and worms.

THE BLACK-HEADED GULL (*Xema ridibunda*), which is widely distributed in the northern parts of the Old World, is abundant throughout the year on our low marshy coasts, where it breeds. It is frequently found at great distances inland, not only following the ploughs to pick up insects and their larvæ, but even taking up its abode upon lakes and other large sheets of water. This bird is about sixteen inches in length, and has the head and upper part of the neck dark brown, the back and wings French gray, with some of the primaries edged with black, and the rest of the plumage pure white; the bill and feet are bright red. The Black-headed Gull feeds on small fishes, insects, and worms. Its flight is light and buoyant, and its note is a hoarse cackle, having some resemblance to a laugh, whence the specific name of the bird is derived. The nest of this species is made amongst the herbage of the marshes which it frequents.

THE LAUGHING GULL (*Xema atricilla*), a very similar species to the preceding, both in appearance and habits, is abundant on the North American coasts, and also visits the European shores.

THE KITTIWAKE (*Rissa tridactyla*) is an example of a small group of Gulls, in which the hinder toe is represented only by a small tubercle, without any trace of a claw. It is abundant on many parts of the British coasts, and extends hence to the highest northern latitudes. The Kittiwake has the plumage of the back and wings delicate French gray, the outer margin of the first primary and the tips of the succeeding ones black, and the head, neck, and lower surface pure white; the bill is greenish-yellow, with the interior of the mouth orange. The wings are very long and pointed, crossing, when closed, above the tail. This bird breeds on the ledges of lofty and precipitous cliffs, forming a nest of sea-weeds, and usually laying three eggs.

THE IVORY GULL (*Pagophila eburnea*) is distinguished by the pure and delicate white of the whole of its plumage; it has a yellow bill with a greenish base, and black feet. When alive the plumage of this bird is said to exhibit a delicate rosy tint, which vanishes soon after it is killed. The whole length is from sixteen to eighteen inches. The arctic seas are the chief resort of the Ivory Gull, which is very rarely seen so far south as the British islands. Notwithstanding the delicacy of its appearance, it is a most voracious bird, and by no means particular in its choice of food; like the Fulmar it greedily devours any floating carrion or other animal matter, and is a constant attendant upon the whalers during the operation of *flensing* or cutting the blubber off the whales.

THE COMMON SKUA (*Lestris cataractes*).—The Skuas, although nearly allied to the ordinary gulls, are distinguished from them by the possession of a more powerful, hooked beak, in which the base of the upper mandible is covered with a cere, and by their large and strongly-hooked claws. These characters indicate very predaceous habits, and the Skuas are to be reckoned amongst the most raptorial of the aquatic birds.

The Common Skua is an inhabitant of the arctic seas, and visits the British shores chiefly in the winter. This, or a very nearly allied species, is also found abundantly about the Falkland Islands, the Straits of Magellan, and other parts of the antarctic ocean. It is of a dark-brown colour, slightly variegated with reddish-brown; the primaries are marked with dirty white near their base; the two middle tail-feathers are scarcely longer than the rest; and the bill and feet are black. The length of the bird is about two feet.

The Skua is generally seen in pairs. Its flight is exceedingly rapid and powerful, and it avails itself of this advantage to chase the smaller gulls and compel them to give up the fishes which they have just caught, rarely taking the trouble of fishing for itself. It also preys upon its smaller neighbours, and displays its analogy with the Raptorial birds by tearing its prey to pieces with its bill, securing it the while by means of the crooked claws with which its toes are armed. This bird breeds upon the rocks, and lays two or three eggs. It defends its young with great courage, and will even beat off the eagle if he comes too near its place of abode.

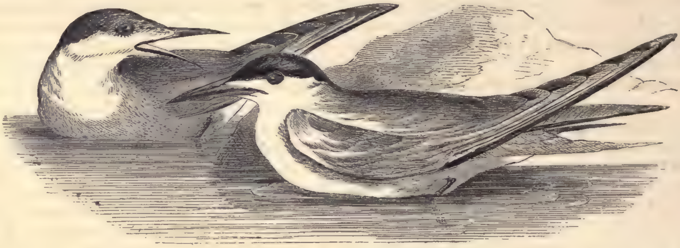
THE ARCTIC SKUA (*Lestris parasiticus*) is considerably more abundant in Britain than the preceding species, and even breeds on our northern shores. It is readily distinguished by its much smaller size, by the elongation of the central feathers of the tail, and by the pale colour of the lower surface. In its habits it resembles the Common Skua. Two other species —the POMARINE SKUA (*L. pomarinus*) and BUFFON'S SKUA (*L. Buffonii*)—are found on our coasts; the latter is a very small species, measuring only twelve inches in length to the extremity of the very elongated middle tail-feathers; it has the neck and breast white.

THE BLACK SKIMMER (*Rhynchops nigra*).—The preceding species, with many others scattered over the seas of nearly the whole world, may all be regarded as true Gulls; but we come now to an example of a small subordinate group, which differs from them in some very peculiar characters. The most striking peculiarity of the Skimmers is to be found in the form of their bill, which suffices to distinguish them at once from all other birds. This organ is elongated and compressed, almost resembling a pair of blades placed one above the other; the upper mandible is considerably shorter than the lower one, which consequently projects some distance beyond it. The wings are long and pointed, indicating great power of flight, and the tail is forked. The Black Skimmer is an inhabitant of the coasts of America, from the Straits of Magellan to the United States. It is about nineteen inches long, black above, with a white band on each wing, and white beneath; the bill and legs are red. Supported on its long and pointed wings, which sometimes extend fully forty inches, the Skimmer darts swiftly along the surface of the ocean, dipping the extremity of its curious bill into the water as it moves along, for the purpose of capturing the small fishes and crustacea upon which it chiefly feeds. This, however, is not, according to Lesson, the only use of the bill; that writer states, that on the coast of Chili the Skimmers insert the knife-like extremity of the lower mandible into the gaping shells of the bivalve mollusca left nearly dry by the retreating tide; the mollusc, objecting to this treatment, immediately closes his shell, and in so doing of course seizes the bill of his enemy, who then drags him from his retreat amongst the sand, carries him up to the beach, breaks his shell open by a few blows, and speedily devours its contents. The few other species of Rhynchops are met with chiefly in tropical seas.

THE COMMON TERN (*Sterna Hirundo*)—fig. 136.—The Terns, of which a vast number of species have been described from the seas of all parts of the world, are distinguished from the Gulls by their long, straight, and pointed bills, small slender feet, very long wings, and forked tails; from the latter characters, and their incessant activity on the wing, they are frequently known as SEA-SWALLOWS. These are not the only points of resemblance between the Terns and the Swallows; in their mode of flight there is some similarity, many of them capture insects on the wing, and hawk about in pursuit of them over lakes and inland marshes, and the species met with in temperate climates are for the most part summer visitors, and retreat, like their name sakes, to warmer regions at the approach of winter. The females lay from two to four eggs, either on the bare ground or on the ledges of rocks, without any nest; and the old birds exhibit much courage in defending their offspring from the attacks of other birds.

The Common Tern is an exceedingly elegant species, of a slender and graceful form, with long wings crossing above the forked tail, of which the lateral feathers run out into very long and acute points. The whole top of the head is black, the back and wings are pale gray, the whole lower surface white, and the bill and feet coral-red. The whole length of the bird is about fourteen inches. This species inhabits Europe and Africa: it arrives on our coasts in May, and leaves us in September. Its food consists of small fish, and although chiefly seen about the sea, it will not unfrequently advance far inland along the course of large rivers, and even sometimes take up its abode upon a lake. The nest of this species is usually made upon the ground in a marshy place. Three other similar species are met with in this country; these are the CASPIAN TERN (*S. caspia*), the ROSEATE TERN (*S. Dougallii*), and the SANDWICH TERN (*S. Boysii*). The former is a large species, measuring nineteen inches in length, although its tail is much shorter than that of the species just described.

Fig. 136.



The Common Tern (Sterna hirundo).

THE ARCTIC TERN (*Sterna arctica*) has also some resemblance to the common Tern, but the lower surface is gray instead of white. This bird appears to advance further north than the other species, being found breeding upon the shores of the arctic seas in both hemispheres. Its tail and wings are even longer than in the species figured above.

THE LESSER TERN (*Sterna minuta*) is a beautiful little species, measuring only eight inches in total length. It is widely distributed over the whole northern hemisphere, and is not uncommon on the British coasts. The top of the head is black, with a white patch on the forehead, the back and wings are delicate pearly-gray, and the lower surface is pure white.

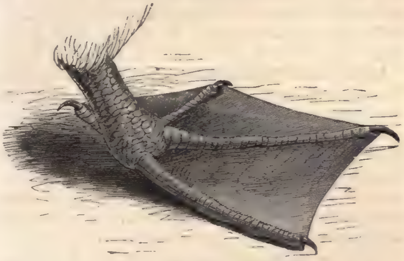
THE BLACK TERN (*Hydrochelidon nigra*) has the tail less forked than in the preceding species, and its plumage is of a dark gray colour, with the vent and under tail-coverts white; the bill is black, and the feet are reddish-brown, with the membrane not extending much beyond the middle of the toes. The length of this bird is nearly ten inches. It is found inland about marshes, lakes, and large sheets of water. Its food consists chiefly of dragon flies, beetles, and other insects, which it captures on the wing in the manner of a swallow.

THE NODDY (*Anoüs stolidus*) is a species nearly allied to the true Terns, but differs from them in the form of the tail, which is rounded off at the extremity instead of being forked. The plumage is of a dark brown colour, with the top of the head buff, and the back of the head sooty-gray; the bill and feet are black. Its length is about fourteen inches. This bird is found in the warmer parts of the Atlantic ocean, on both shores of which it is well known, but can hardly be regarded as more than an occasional visitor to the British islands. It feeds upon fishes, which it captures as it skims over the waves. The Noddy breeds on the rocky islands of the Atlantic, where it makes its nest with a little sea-weed, but on the keys of the Gulf of Mexico, where it is very abundant, it builds a regular nest in a tree or bush. It lays three eggs.

FAMILY VI.—PELECANIDÆ.

The birds forming this last family of the order Natatores, and concluding our review of the class of birds, are at once distinguishable from all others by the structure of their feet, which have the hinder toe turned inwards, and united by a narrow triangular web with the inner anterior toe—fig. 137. They have a head of small or moderate size, supported upon a long and slender neck, and armed with a bill which is also usually elongated in its form, and terminated either by a sharp point, or, as far as the upper mandible is concerned, by a hooked nail. The legs, which are generally short and stout, are not placed very far back, and the wings are generally of great extent and power. These birds are all great destroyers of fish, which constitute their sole nourishment. In other respects their habits exhibit much diversity, and will be best understood by referring to examples of the different forms occurring in the family.

Fig. 137.



Foot of Pelican

THE COMMON PELICAN (*Pelecanus Onocrotalus*).—The Pelicans are distinguished by their very long bills, of which the upper mandible is terminated by a hook, and the lower one furnished with an enormous pouch, formed of a naked leathery skin, in which the birds are enabled to stow away the fishes which they capture in their excursions over the surface of the rivers. They are large and powerful birds, the species now under consideration measuring between five and six feet in length, and twelve or thirteen in expanse of wing. Its plumage is white, with more or less of a rosy tinge, and the nail at the tip of the upper mandible is bright red. This bird frequents both the seas and the fresh waters of Asia, Africa, and Eastern Europe, and is generally seen in small flocks. It swims and flies exceedingly well, and, notwithstanding its large size, perches freely upon the branches of trees. When seeking its food, the Pelican sweeps on its enormous wings at some little height above the surface of the water, until it perceives a fish passing beneath it, when it instantly dashes down upon its victim with the most astonishing velocity, and with such precision, that it rarely misses its aim. The fish when captured is stowed away in the great yellow pouch under the chin, and the Pelican then flies on to seek more prey. The nest of this bird consists of a mass of grass, sedges, and other aquatic plants, and is usually placed quite close to the edge of the water. The eggs are two or three in number. During the process of incubation, the male is said to furnish his partner with food, and when the young are hatched both parents are assiduous in attending upon them. In disgorging their prey for the nourishment of their young, the birds are described as pressing the pouch against the breast; and it is generally supposed that the notion which prevailed amongst the ancients, and came down nearly to our own day, that the Pelican in times of scarcity nourished her young with her own blood, must have originated in the observation of the gesture above-mentioned, when the bright red tip of the bill, strongly contrasted with the pure white plumage of the breast, would easily produce the impression of a spot of blood. About ten other species of Pelicans are known to naturalists. They are scattered over almost the whole world, but agree in their general habits.

THE GANNET (*Sula Bassana*), also called the SOLAND GOOSE, and sometimes the BOOBY, is another large species of this family, which is found in thousands upon certain parts of the coast of Britain, and occurs elsewhere on the shores both of Europe and North America. One of its best known British stations is the Bass rock in the frith of Forth, from which, indeed, its specific name is derived. The adult Gannet is nearly three feet in length, and is of a white colour, with the naked skin of the sides of the face blue, the head and neck yellowish or buff, and the primary feathers black. The young bird exhibits a blackish plumage, more or less spotted with white.

In their mode of life the Gannets much resemble the Pelicans. They fly rapidly over the surface of the sea in search of the fishes on which they feed, and on seeing their prey beneath them, immediately rise into the air to gain sufficient impetus to carry them down to the requisite depth in the water, and then closing their wings, descend perpendicularly upon their intended victim, which, indeed, they rarely miss. They are very partial to herrings, pilchards, and sprats, which, swimming in large shoals, and always near the surface of the water, insure them a good supply of food, and the fishermen, when they see a flock of Gannets busily engaged, know at once where to direct their boats.

The nest of the Gannet consists of a mass of weeds and grass, placed upon a ledge of rock. In this the female lays a single white egg, and the young bird when hatched is furnished with an abundant supply of food by its parents. On the Bass rock the young birds are taken in considerable numbers every year, and sold for food at a low price. They are clothed with a beautiful white down, said to be quite equal to swan's-down for making tippets, &c. The old birds are taken for the sake of their feathers. A method sometimes adopted for securing them consists in fixing a herring upon a board and towing it along the surface of the sea; the Gannets, seeing it, dart down upon it immediately, and generally kill themselves by the force with which they strike the board. On the Bass rock, where they are protected, they become so tame that they will allow themselves to be stroked by the hand as they sit upon their nests.

THE CORMORANT (*Phalacrocorax Carbo*).—The Cormorants constitute an exceedingly numerous group of birds, including species scattered in all parts of the world, and frequenting indifferently salt and fresh water. They have a rather long, nearly straight, compressed bill, with the upper mandible strongly hooked at the tip, but destitute of the pouch characteristic of the Pelicans; the face and upper part of the throat are naked, and the latter is capable of much dilatation, so as to serve as a receptacle for their prey.

The Common Cormorant is a large bird, measuring about three feet in total length. It is of a black colour beneath, and dark-brown above, with the margins of the feathers black; on each thigh there is a white patch; the naked skin of the face and throat is yellow, bordered with white. In the spring and summer the feathers of the back of the head are elongated, forming a sort of crest, and the head and neck bear numerous slender white feathers.

This bird is abundant on the British coasts, where it breeds on the elevated ledges of lofty cliffs, making a large nest of grass and sea-weeds, in which the female lays from four to six eggs. The Cormorant flies well, and, unlike the preceding species, swims rapidly, and dives with facility in pursuit of its slippery prey, in securing which the hooked point of the upper mandible is of the greatest service to it. It is widely distributed in the Old World, extending from this country to China.

THE FISHING CORMORANT (*Phalacrocorax sinensis*), a native of Northern India and China, is trained by the Chinese to the business of fishing, for which our British species was formerly employed. The Chinese species is taken to the water with a leather thong or metal ring round his neck to prevent his swallowing the fish, and carried in a small boat to the fishing station. Each boat carries several cormorants, which descend from it into the water at the word of command, dive down in pursuit of the fishes, and on making a capture bring their prey to their master with the greatest docility. If one of them gets hold of a fish too large for his strength, the others will come to his assistance, and between them the struggling prey is conveyed to the boat. A second British species of this genus is the SHAG or GREEN CORMORANT (*P. graculus*), which ranges as far south as the Cape of Good Hope.

THE FRIGATE BIRD (*Tachypetes aquilus*).—This bird is distinguished by having the tips of both mandibles bent downwards, by the enormous length of its wings, which are larger in proportion to its size than in any other bird, and by the small size of its feet, of which the toes are only partially united by a web. The Frigate Bird is abundant on the Atlantic shores of both America and Africa; it passes nearly its whole life in the air, through which it darts with incredible swiftness, or sails along with outstretched pinions at a considerable height, looking out for its prey, on which it descends with lightning-like rapidity and the most unerring precision. Not content with the produce of his own fishing, however, he often acts the part of a pirate, attacking other marine birds, and compelling them to disgorge their booty. The Frigate Bird is said to build its nest upon trees.

LE VAILLANT'S DARTER (*Plotus Le Vaillantii*).—The name of Darters is given to a few species of birds inhabiting the tropical regions of both continents, and distinguished by the elongated form of their bodies, their long and slender necks, and elongated pointed mandibles. In most respects they resemble the Cormorants, and, like some of these, frequent fresh waters, haunting the margins of lakes and rivers. They are said frequently to perch upon the branch of a tree overhanging the water, and there to watch for the appearance of a fish, upon which they immediately dart down. When disturbed, they slip into the water with so little effort, that they produce scarcely more agitation of the surface than might be caused by an eel. They nidificate on the branches of trees. The species figured, Le Vaillant's Darter, is a common species in Southern Africa, where it is known under the name of the *Schlanghalsvogel* or *Snake-necked bird.*

THE COMMON TROPIC BIRD (*Phaëton æthereus*), although nearly related to the Darters, is essentially oceanic in its mode of life, passing its whole existence in almost incessant activity over the waves of the tropical ocean. It is from the fact that this bird and its allies are rarely seen beyond the tropics, that their ordinary name is derived; they are also known under the name of *Paille-en-queue* or *Straw-tail*, in allusion to the two long and slender feathers which they bear in their tails. These feathers in the present species are of a pale-yellow or whitish colour. Notwithstanding the distances to which it flies over the open sea, this bird is said to return every night to roost upon dry land; its food consists entirely of fish, and it breeds, like most of its tribe, upon the rocks of the tropical shores or upon the scattered islands of the ocean. Another well-known species is the RED-TAILED TROPIC BIRD (*P. phœnicurus*), which has the elongated feathers of the tail red.

THE MUSEUM

OF

NATURAL HISTORY.

BIRDS

BY

WILLIAM S. DALLAS, F.L.S.,

Curator of York Museum; Author of Treatise on Zoology; Elements of Entomology, &c.

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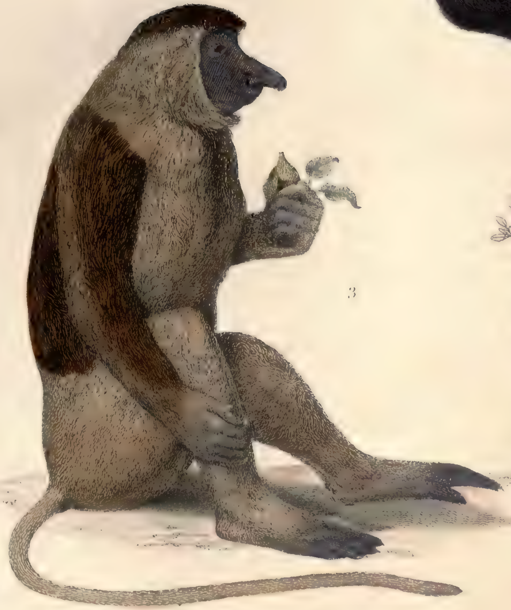
MAMMALIA.

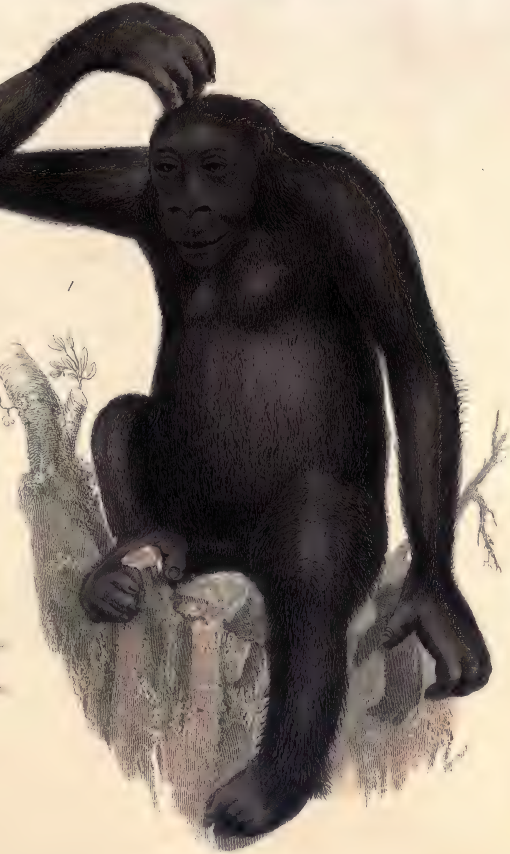
Genera Troglodytes. Simia Nasalis.

Order. Quadrumana.

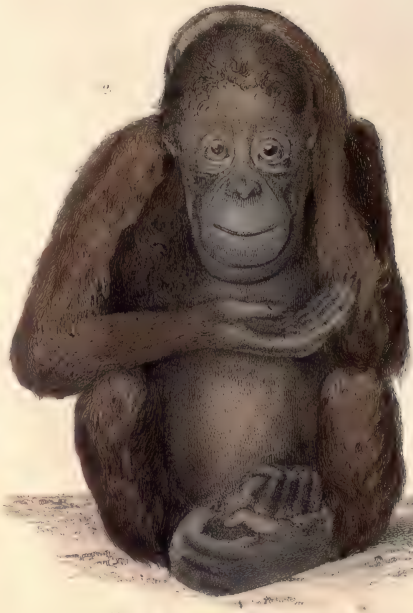
Family. Simiidæ.



N. Larvatus. Proboscis Monkey.



Troglodytes Gorilla. Gorilla.



Simia Satyrus. Ourang Outan.

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PLATE 2.

MAMMALIA.

Order. Quadrumana.

Genera Papio. Mycetes. Ateles. Cebus.

Families { Simiidæ. Cebidæ.

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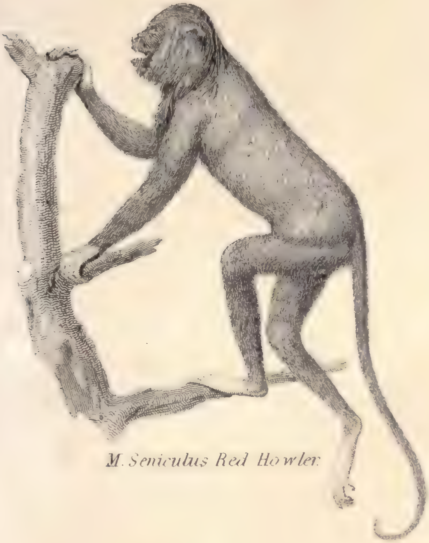

M. Seniculus Red Howler.

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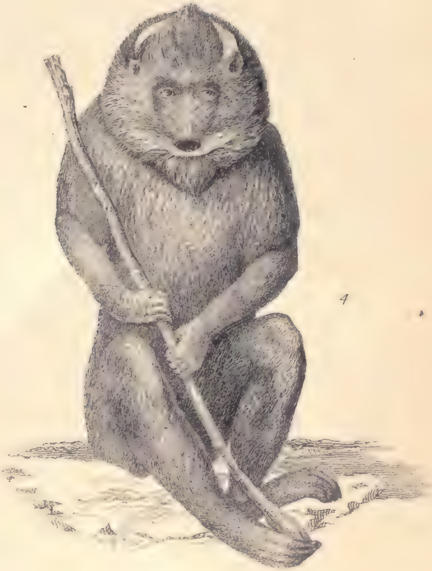

P. Mormon. Mandrill.

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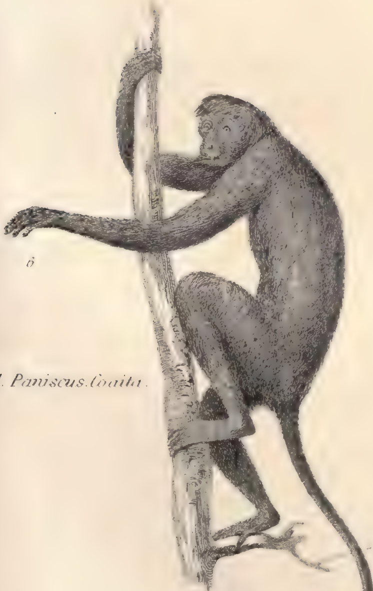

A. Paniscus. Coaita.

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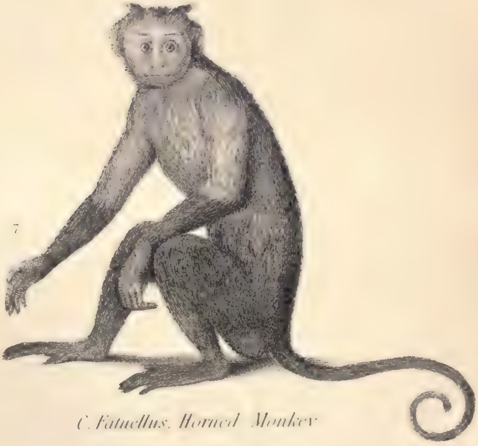

C. Fatuellus. Horned Monkey.

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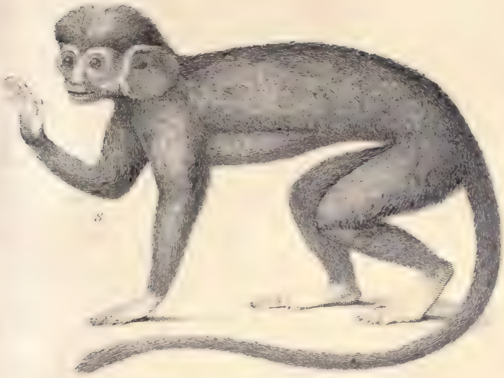
MAMMALIA.

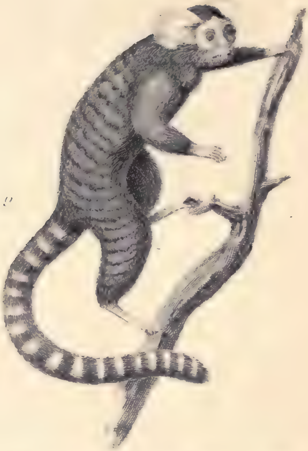
Order Quadrumana

Families Cebidæ
Hapalidæ
Lemuridæ.

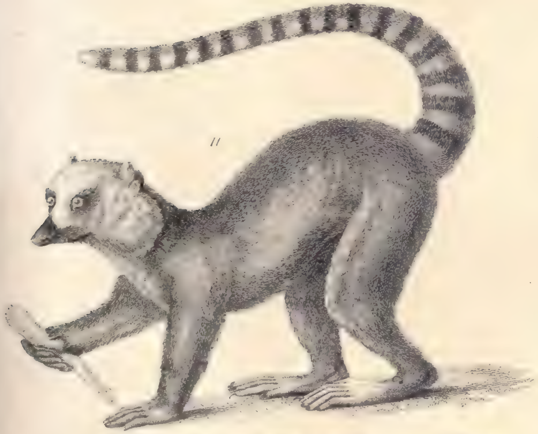
Genera Callithrix, Jacchus. Lemur. Indris.



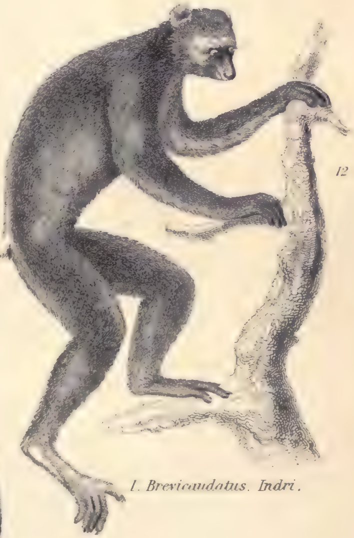
Cal. Sciureus. Squirrel Monkey



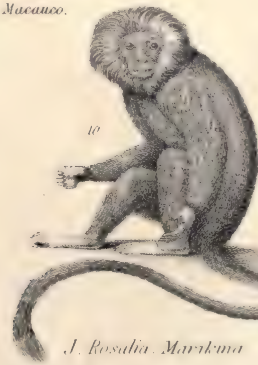
J. Vulgaris. Common Mormozet.



L. Catta. Ring tailed Macauco.



I. Brevicaudatus. Indri.



J. Rosalia. Marikina

MAMMALIA.

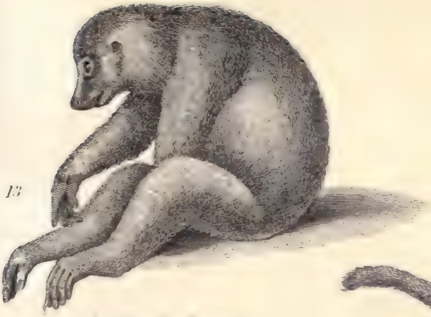
PLATE 4

Order, **Quadrumana.**

Genera. Loris. Galago. Tarsius. Galeopithecus.

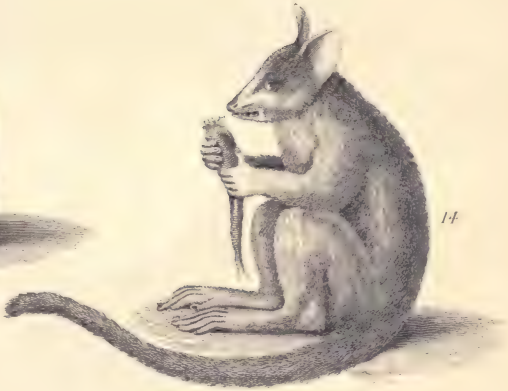
Families.
Nycticebidæ.
Tarsidæ.
Galeopithecidæ.

13



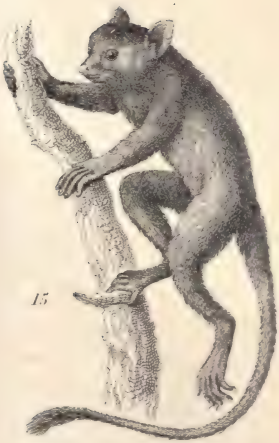
Lor. Gracilis. Bengal Lori.

14



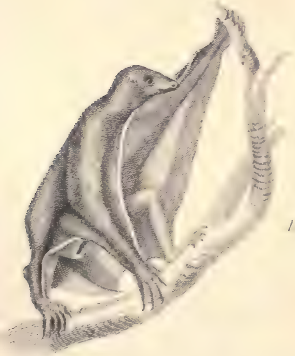
Galago Senegalensis. Senegal Galago.

15



T. Spectrum, Tarsier.

16



Galeopithecus Volans, Flying Lemur.

[illegible]

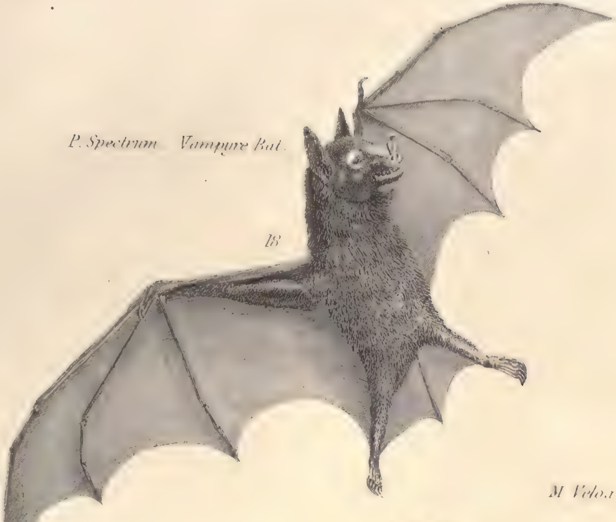
MAMMALIA.

Order. Chiroptera

Genera. Pteropus, Phyllostoma, Moloſsus

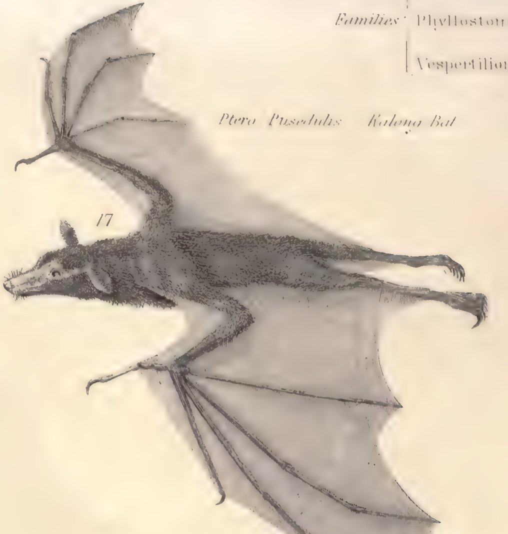
Families.
- Pteropodidæ
- Phyllostomidæ
- Vespertilionidæ

P. Spectrum Vampire Bat.



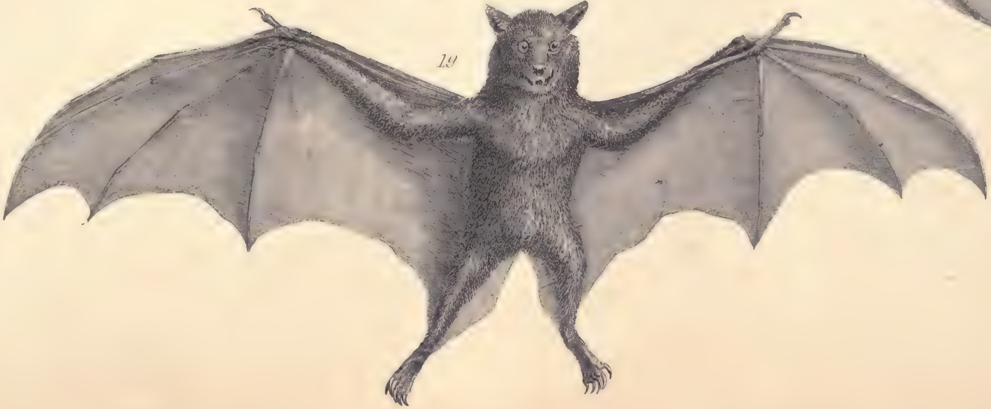
18

Ptero Pusedulis Kalong Bat



17

M Velox. Bulldog Bat



19

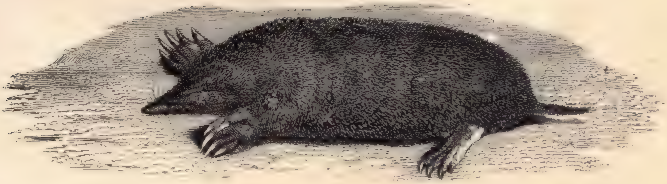
MAMMALIA.

Genera. Erinaceus, Sorex, Talpa.

Order. Insectivora.

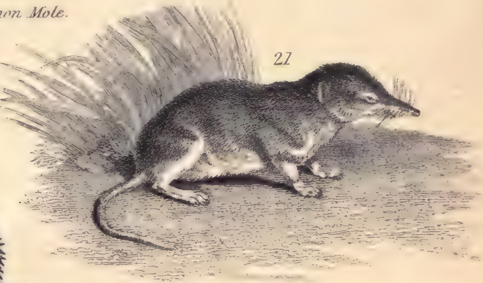
Families
Erinaceidæ.
Soricidæ.
Talpidæ.

22



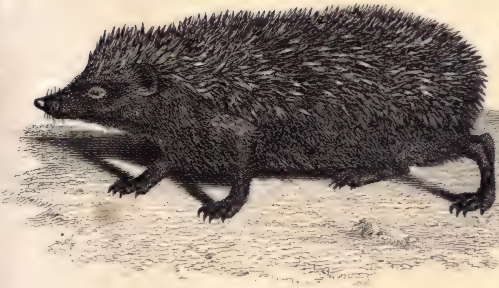
T. Europæa. Common Mole.

21



S. Araneus. — Common shrew.

20



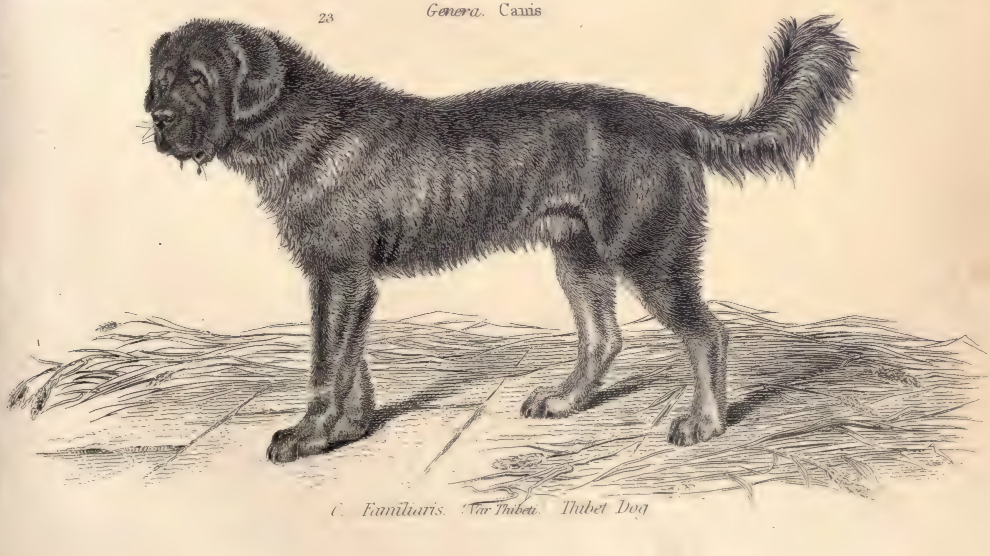
E. Europaeus. — Common Hedgehog.

Order. Carnivora

Family. Canidæ.

Genera. Canis

23



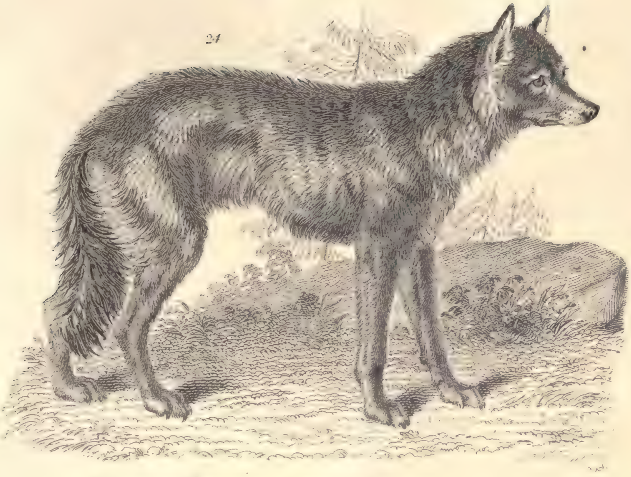
C. Familiaris. (Var Thibeti.) Thibet Dog

WILLIAM MACKENZIE, GLASGOW, EDINBURGH, LONDON

Genera: Canis Megalotis. Vulpes.

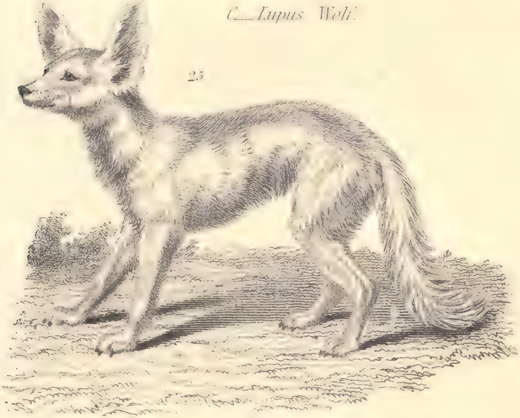
Order. Carnivora. *Family.* Canidæ.

24



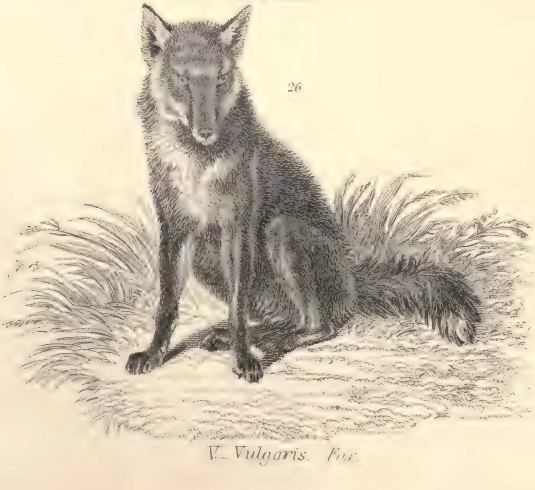
C_Lupus Wolf.

25



M_Zerda-Fennec.

26



V_Vulgaris. Fox.

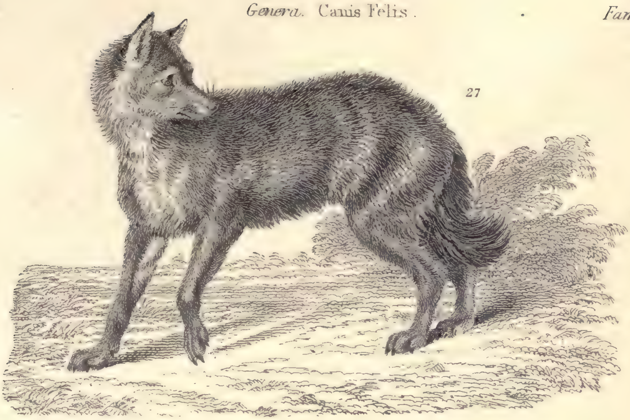
WILLIAM MACKENZIE, GLASGOW, EDINBURGH & LONDON.

MAMMALIA.

Order. Carnivora

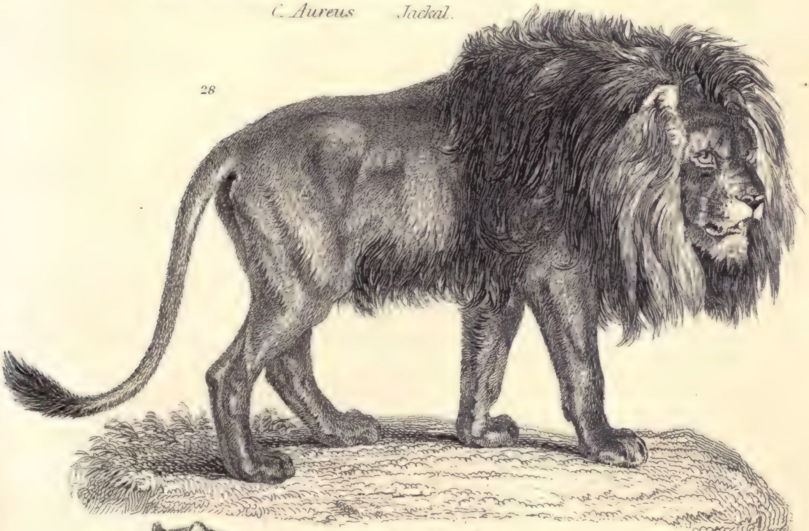
Genera. Canis Felis.

Families { Canidæ.
{ Felidæ.



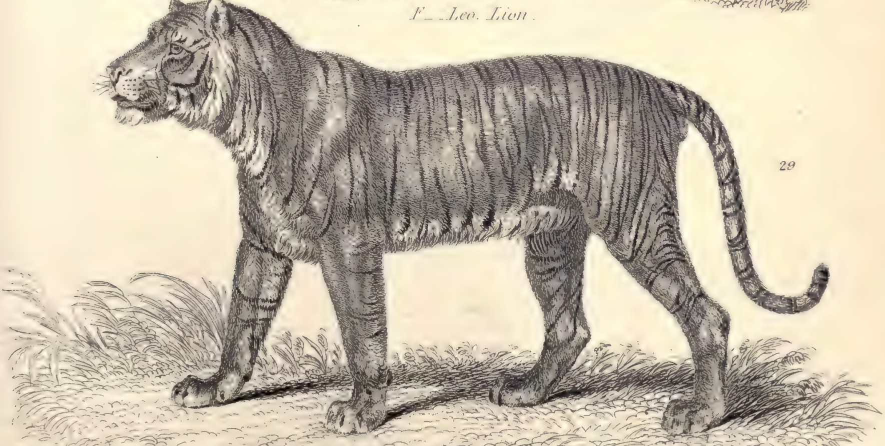
27

C. Aureus *Jackal.*



28

F. Leo. *Lion.*



29

F. Tigris. *Tiger.*

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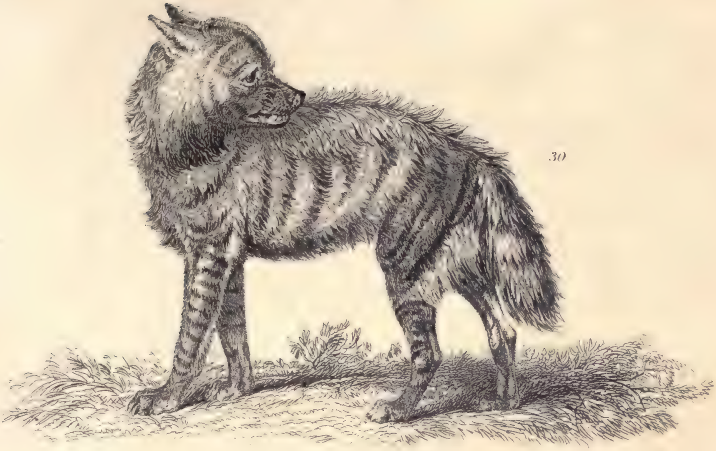
MAMMALIA.

PLATE 9

Order Carnivora.

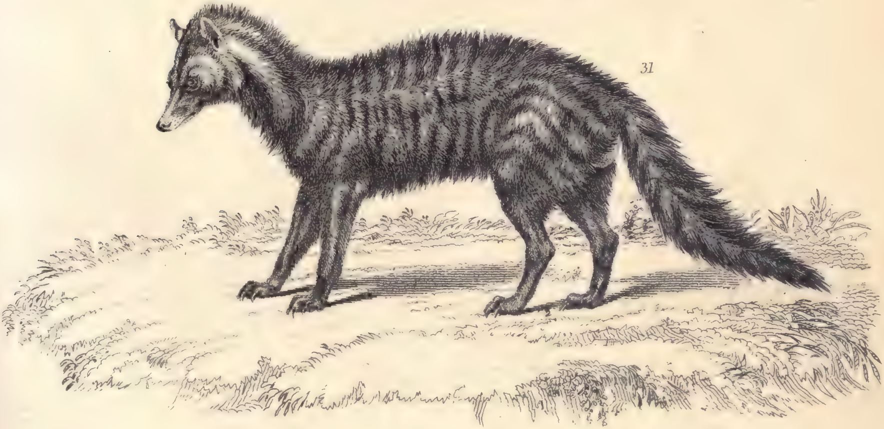
Genera Hyæna. Viverra. Herpestes.

Families { Hyænidæ. Viverridæ



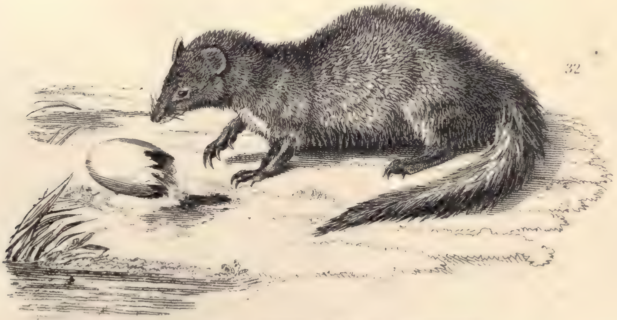
30

H. Striata. Striped Hyæna.



31

V. Civetta. Civet.



32

H. Ichneumon. Egyptian Ichneumon.

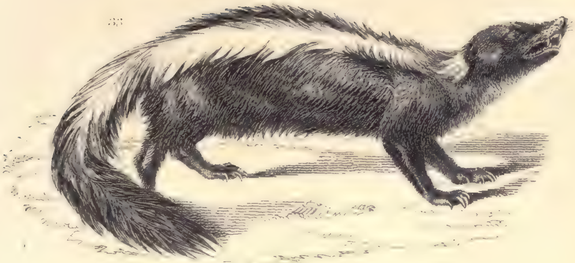
WILLIAM MACKENZIE, LONDON, EDINBURGH & GLASGOW.

MAMMALIA

PLATE 10

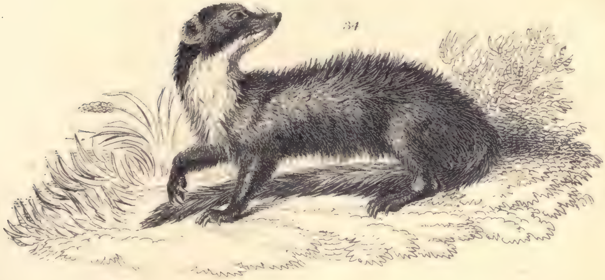
Order Carnivora *Genera.* Mephitis Martus. Lutra. *Families* Mustelidæ.

33



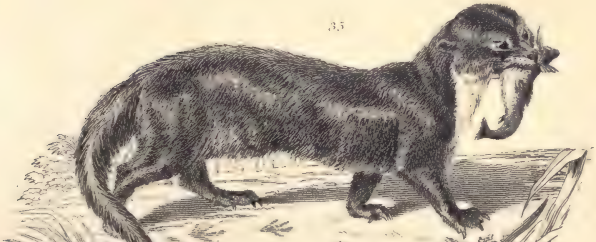
Meph.ˢ varians. Skunk.

34



Mart.ˢ Foina. Pine Martin.

35



L. Vulgaris. Common Otter.

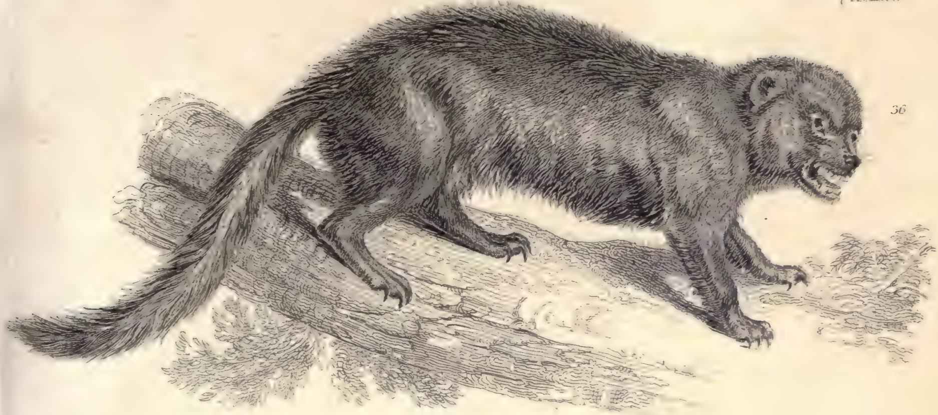
WILLIAM MACKENZIE GLASGOW EDINBURGH & LONDON

MAMMALIA.

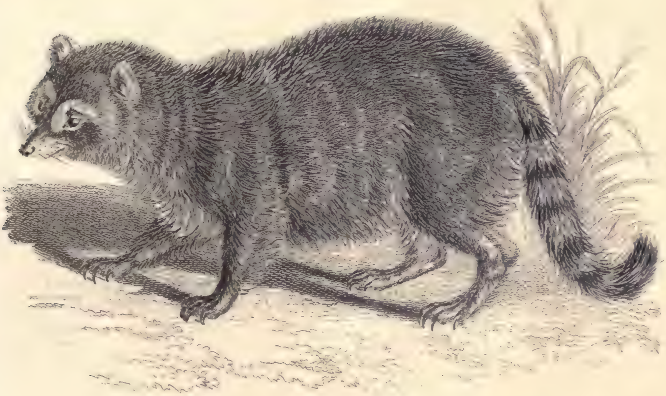
Genera. Gulo. Procyon Nasua.

Order: Carnivora.

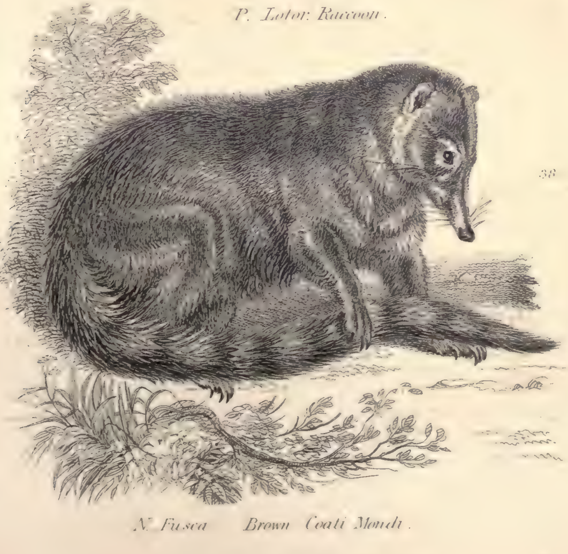
Families {Ursidæ.
{Melidæ



G. Luscus. Wolverine.



P. Lotor. Racoon.



N. Fusca Brown Coati Mondi.

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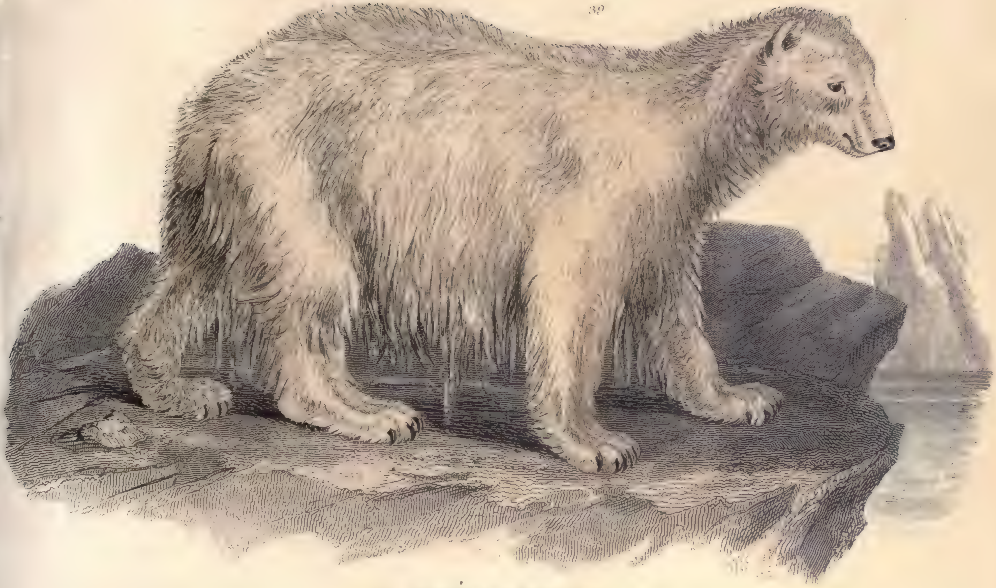
MAMMALIA.

PLATE 12

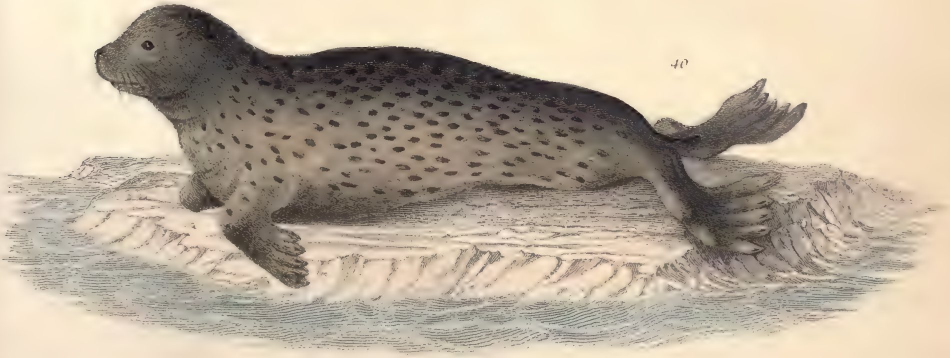
Order. Carnivora. *Genera.* Ursus. *Family.* Ursidæ.



U. Maritimus. Polar Bear

Order. Pinnipedia. *Family.* Phocidæ.

Genera. Phoca.



P. Vitulina. Common Seal.

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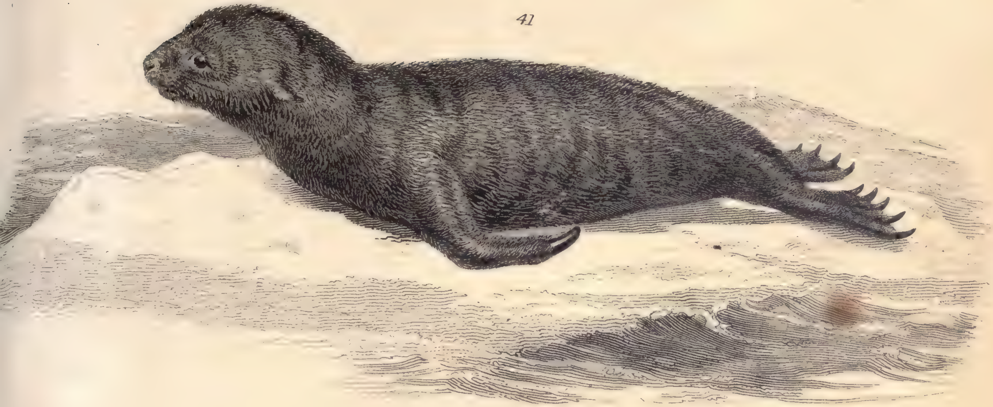
MAMMALIA.

Order. Pinnipedia.

Genera. Trichecus. Arctocephalus.

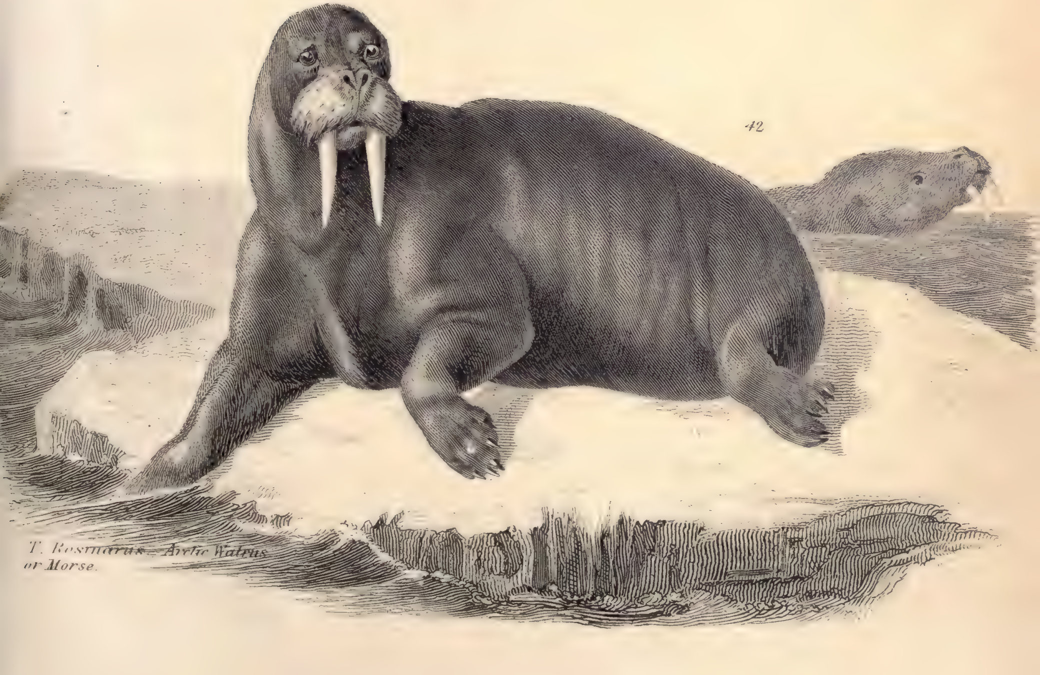
Families { Phocidæ.
Trichecidæ.

41



A. Ursinus.—Sea Bear.

42



T. Rosmarus.—Artic Walrus or Morse.

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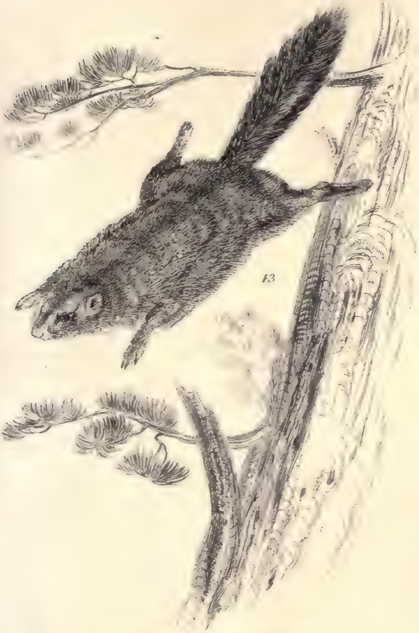
MAMMALIA

PLATE 14

Order. Rodentia

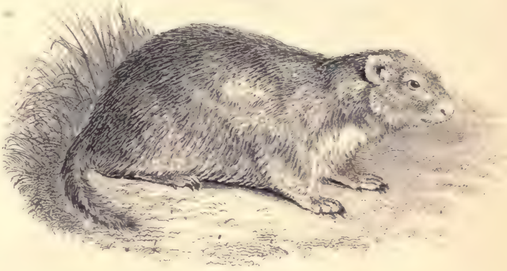
Genera. Sciuropterus. Arctomys. Dipus Helamys.

Families { Sciuridæ. / Dipodidæ



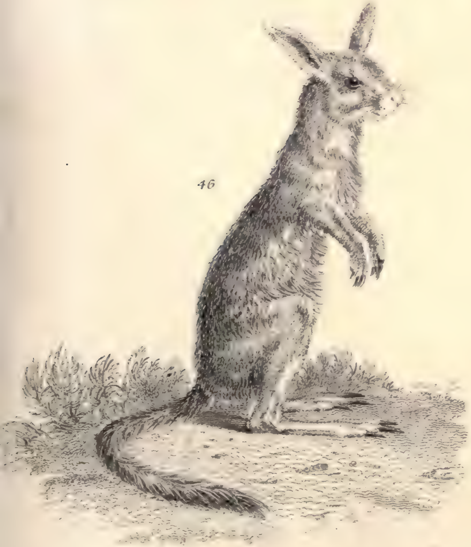
43

S. Sabrinus __ Greater Flying Squirrll.



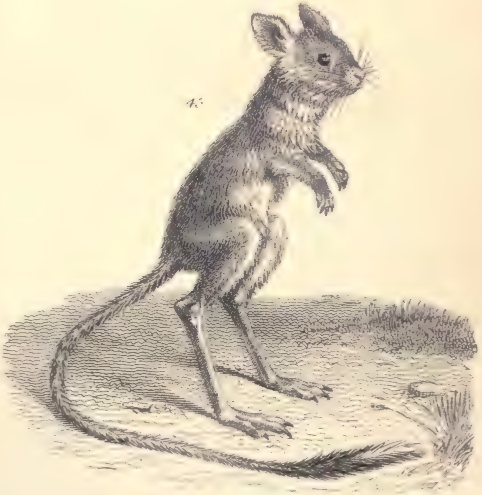
44

A. Marmotta _ Alpine Marmot.



46

Hel. Capensis. __ Cape Jerboa.



45

D. Ægyptius _ Egyptian Jerboa

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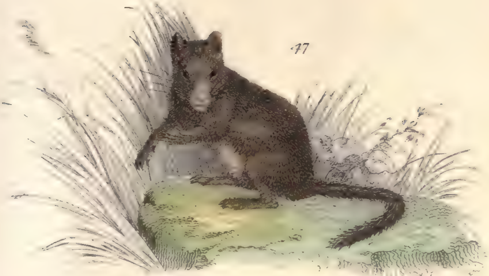
Order. Rodentia.

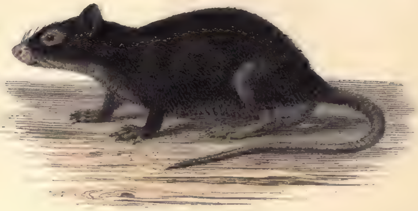
Genera. Myoxus Mus. Myodus Castor

Families (Muridæ Myoxidæ (Castoridæ



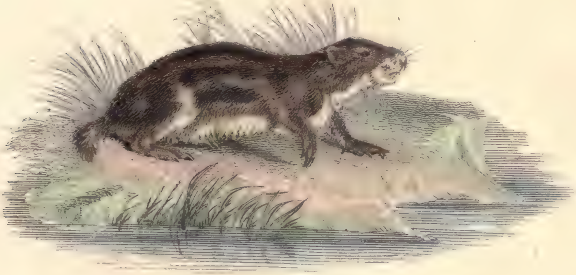
47

My^s Avellanarius.— Dormouse.



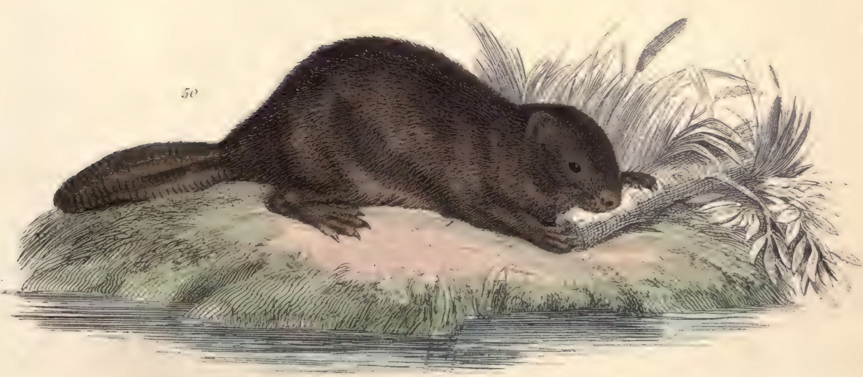
48

Mus. Rattus.— Black Rat.



49

Myod^s Lemmus.— Lemming.



50

C. Fiber.— Common Beaver.

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MAMMALIA

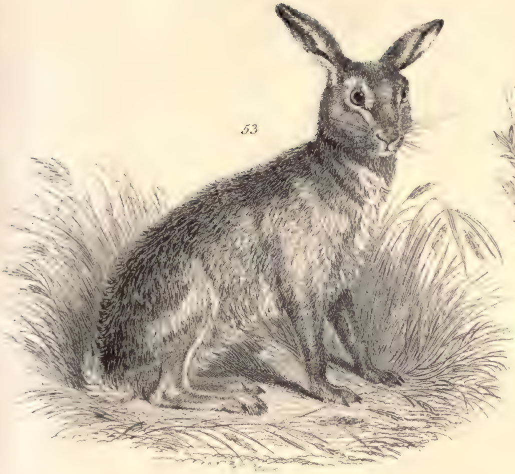
Plate 16

Order Rodentia.

Genera Myopotamus. Hystrix Lepus, Lagomys.

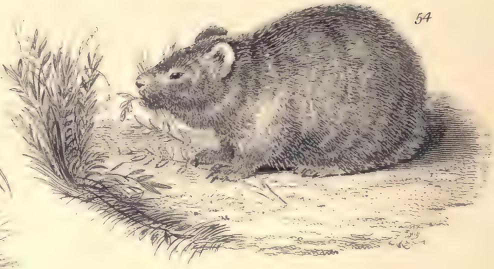
Families {Sciuridæ. Leporidæ. Hystricidæ.

53



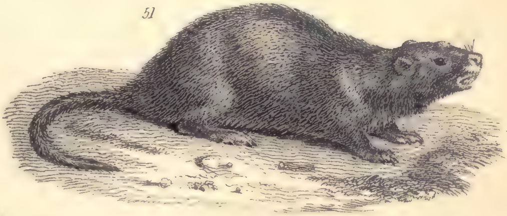
Lep. Timidus. — *Common Hare.*

54



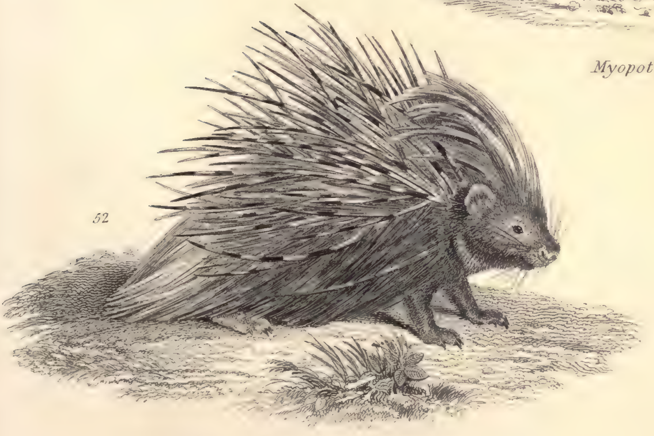
Lag. Pusillus, — *Calling Hare.*

51



Myopot^s Coypu — *Coypu*

52



H. Cristata, — *Common Porcupine.*

WILLIAM MACKENZIE, LONDON, EDINBURGH & GLASGOW

PLATE 17

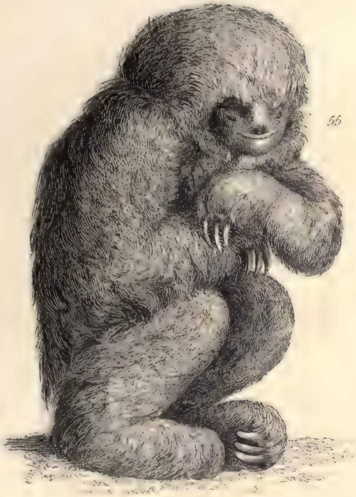
MAMMALIA.

Order. Edentata.

Genera. Bradypus. Dasypus. Myrmecophaga. Manis

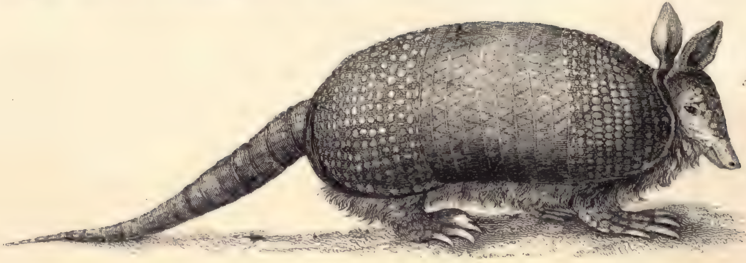
Families. { Bradypodidæ.
Dasypodidæ.
Myrmecophagidæ.

55



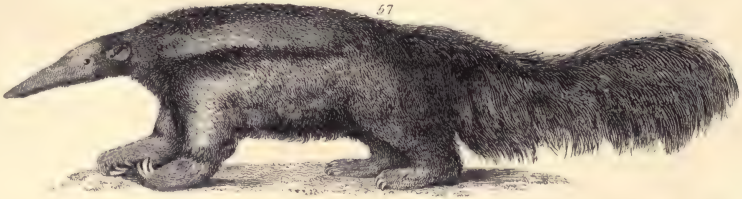
B. Tridactylus. Three-toed Sloth.

56



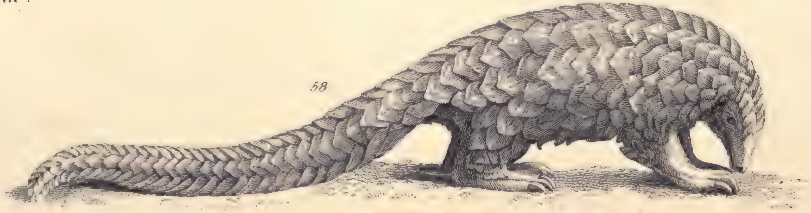
D. Peba. Peba.

57



Myr. Jubata. Great Ant eater.

58

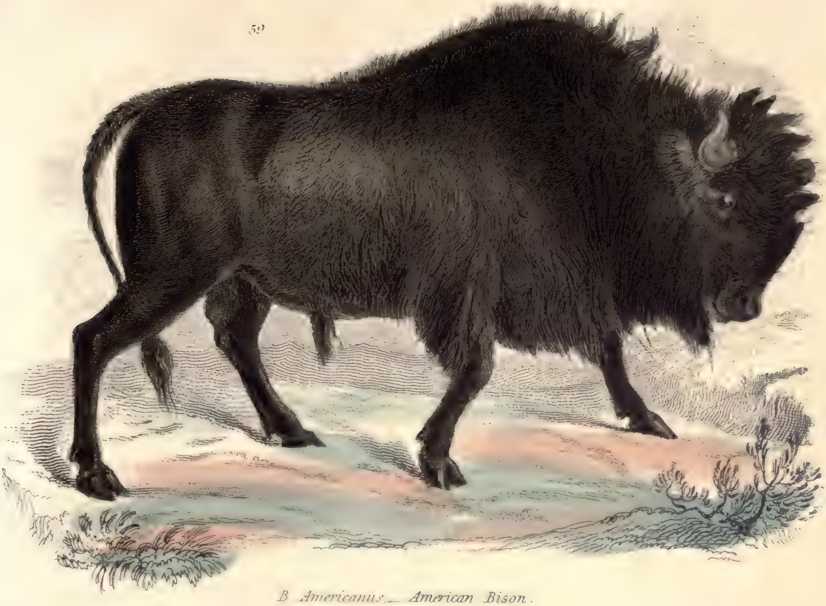


M. Tetradactyla. Long-tailed Manis.

WILLIAM MACKENZIE. GLASGOW EDINBURGH & LONDON

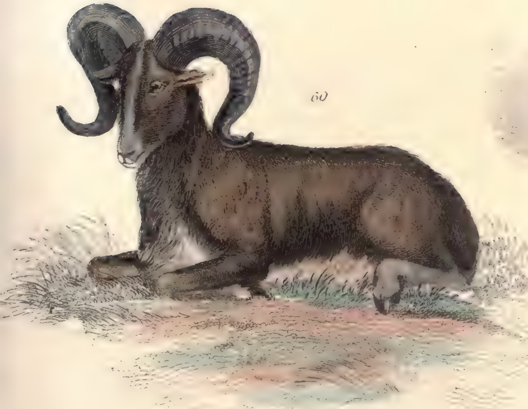
Order. Ruminantia *Genera* Bonasus Ovis. *Family* Bovidæ.

59



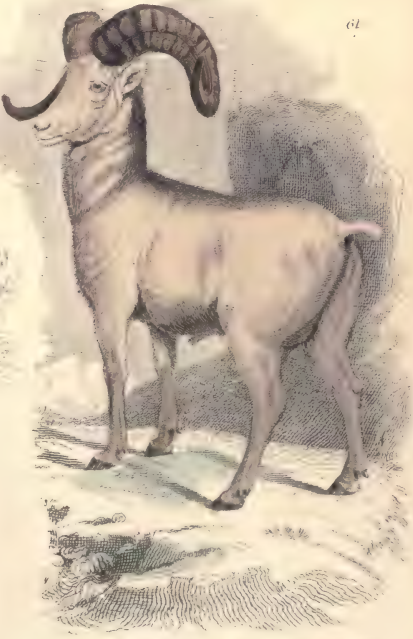
B. Americanus. — *American Bison.*

60



O. Ammon. — *Thibet Sheep.*

61



O. Montana. — *Rocky Mountain Sheep.*

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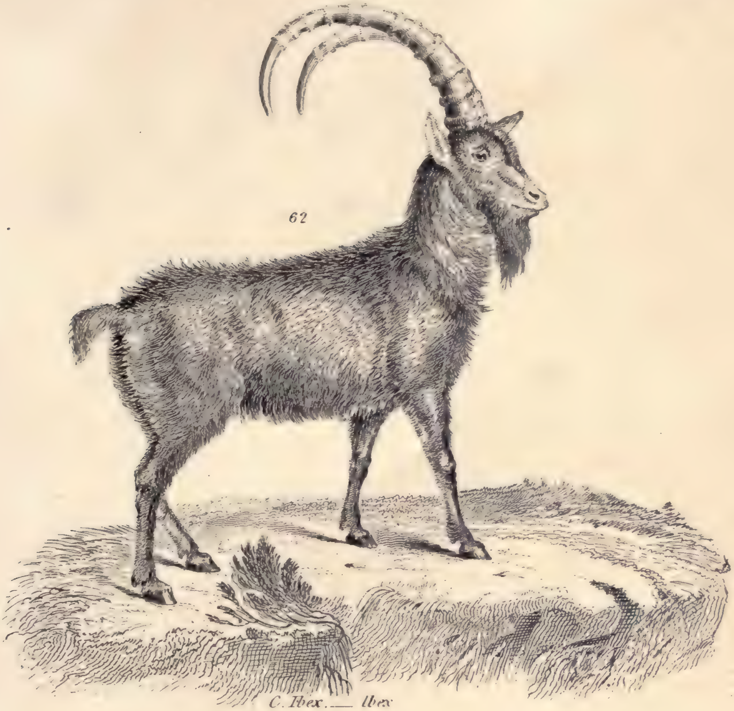
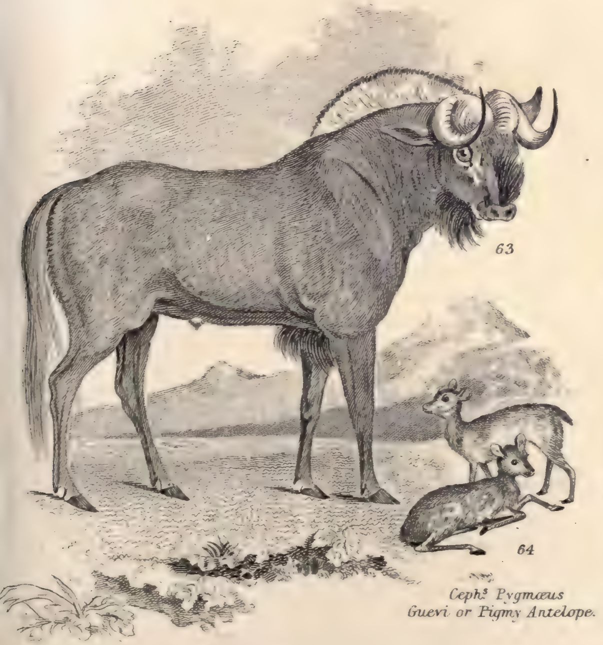
Order. Ruminantia. *Genera,* Capra. Catoblepas. Cephalolophus. Antilope. *Families* {Ægosceridæ. Antilopidæ.

62



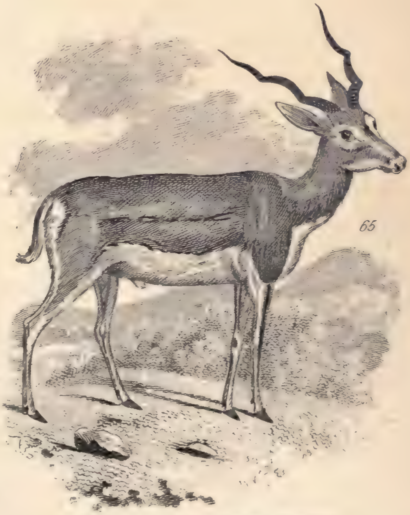
C. Ibex.__ Ibex



63

64

Ceph^{s} Pygmæus
Guevi or Pigmy Antelope.



65

A. Cervicapra__ Common Antelope.

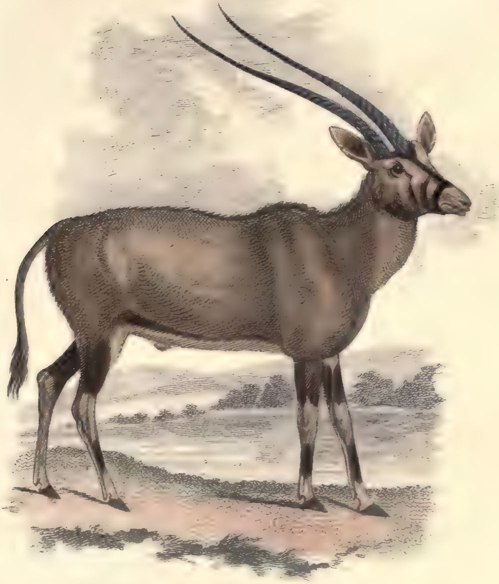
Cat^{s} gnu _ Gnoo.

Genera Oryx Portax

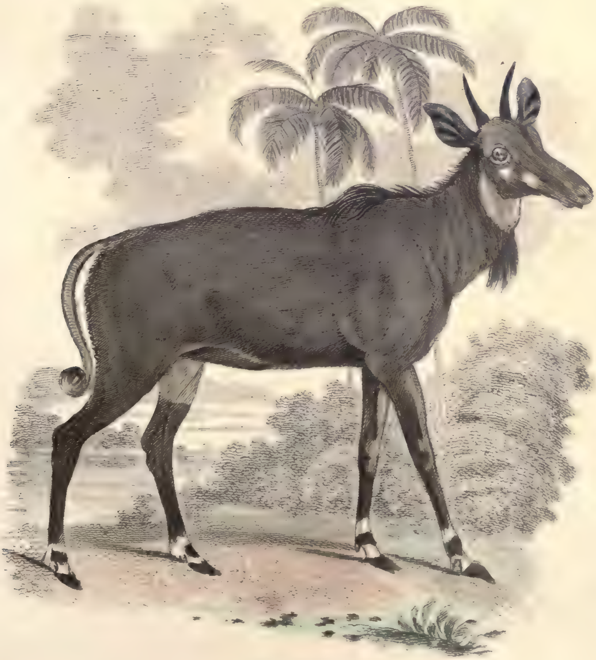
Order Ruminantia

Family Bovidæ

66



O leucoryx — Leucoryx



67

P picta Nyl Ghau

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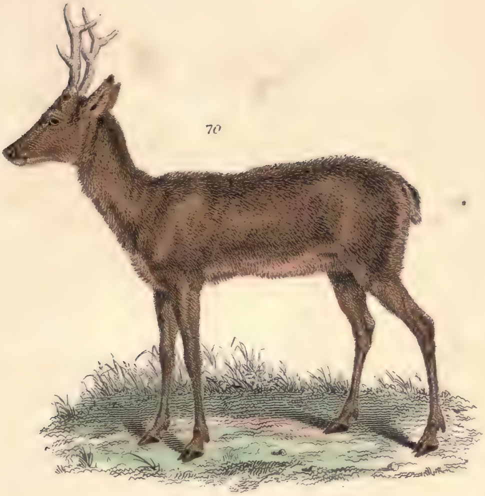
MAMMALIA

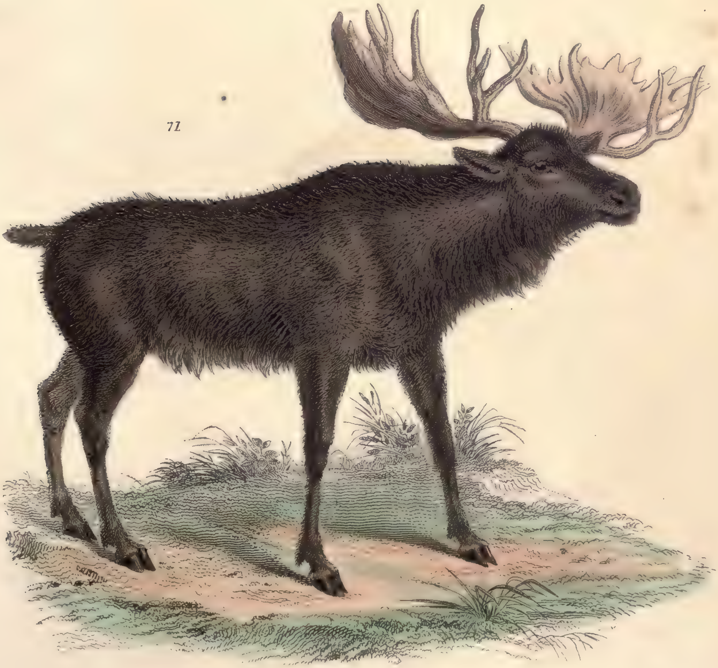
Order. Ruminantia. *Genera* Capræolus Alces. *Family* Cervidæ.

70



Cap.s Capræa .__ Roebuck

71



A. Palmatus. __ Elk or Moose Deer

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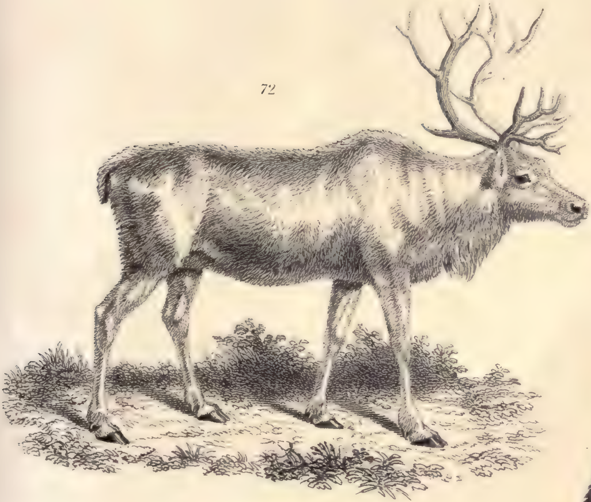
MAMMALIA

PLATE 22

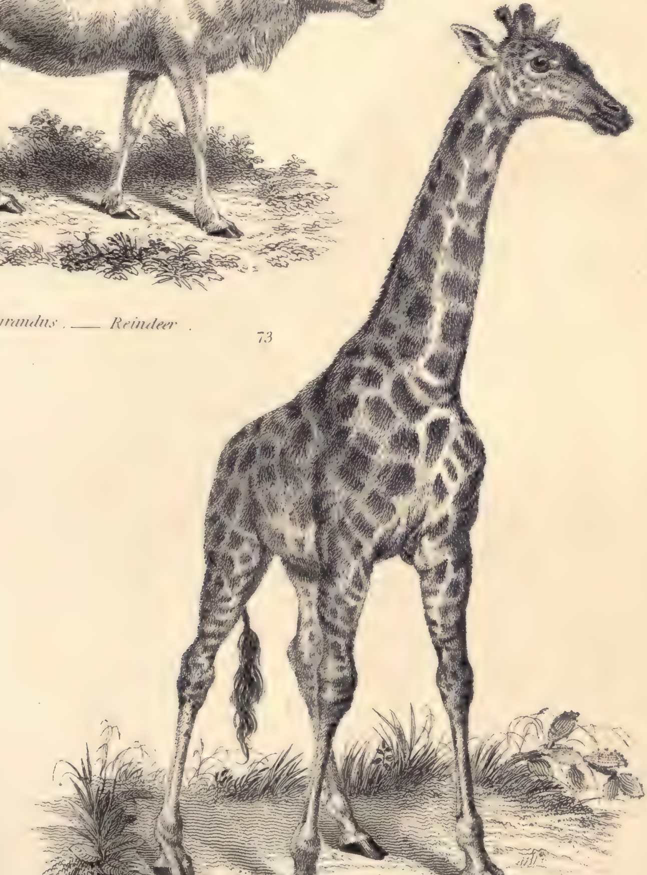
Order. Ruminantia. *Genera* Rangifer Camelopardalis *Families* {Cervidæ. Camelopardidæ.

72



R. Tarandus. — Reindeer.

73



Cam.^s Giraffa. — Camelopard.

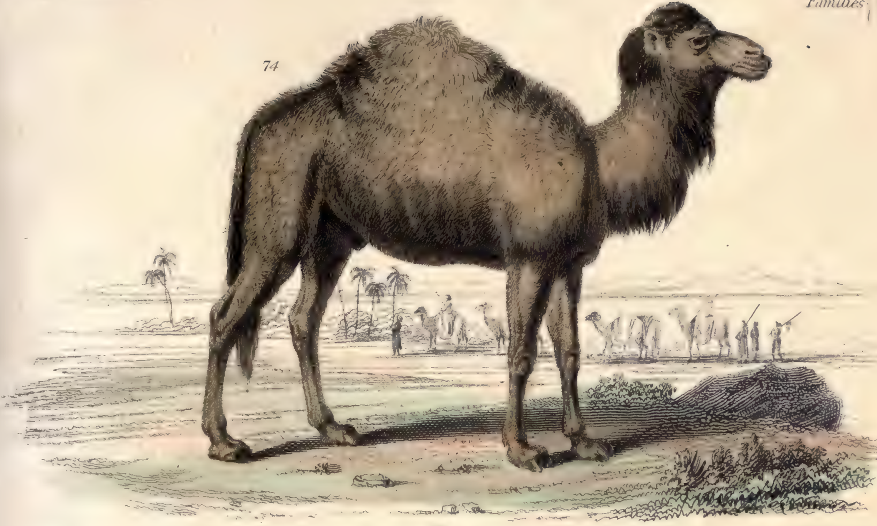
WILLIAM MACKENZIE, GLASGOW, EDINBURGH & LONDON

MAMMALIA.

Genera Camelus. Auchenia. Tragulus.

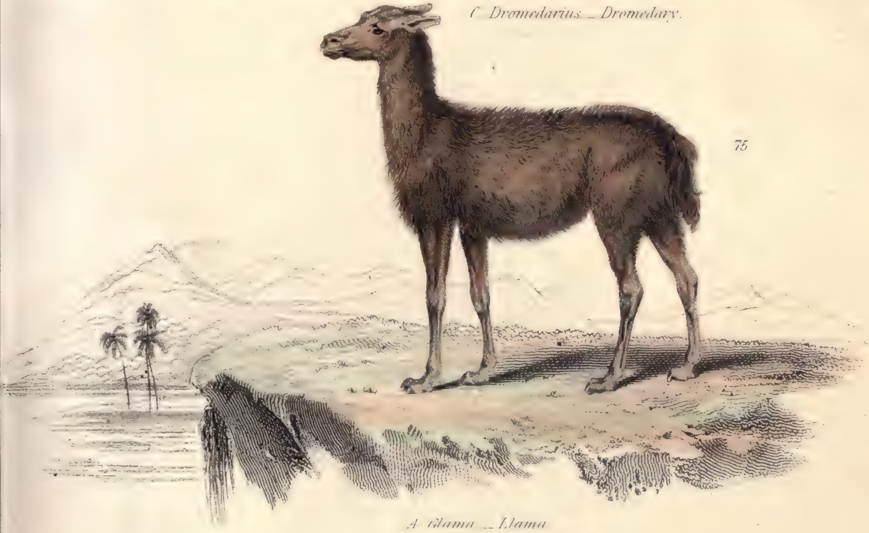
Order Ruminantia.

Families { Camelidæ.
Moschidæ.



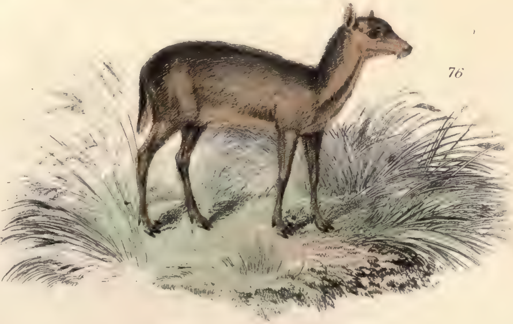
74

C. Dromedarius. _ Dromedary.



75

A. Glama _ Llama.



76

T. Javanicus. Java Musk Deer.

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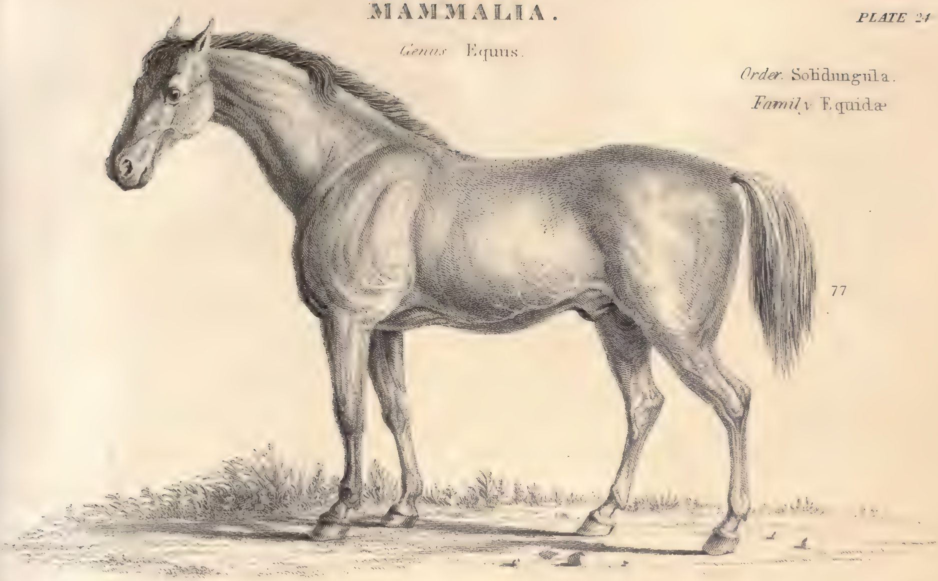
MAMMALIA.

PLATE 24

Genus Equus.

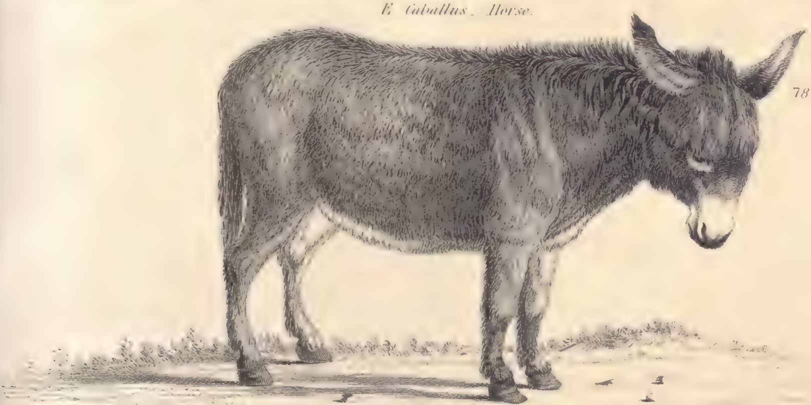
Order. Solidungula.

Family Equidæ



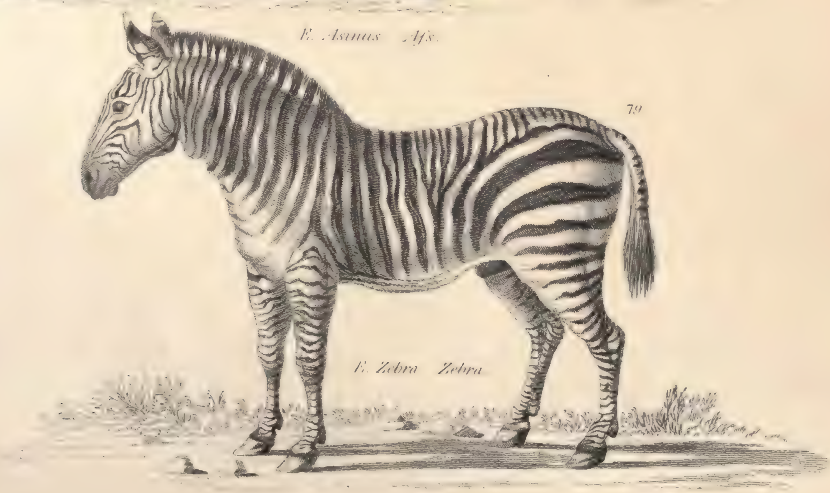
77

E. Caballus. Horse.



78

E. Asinus. Aſs.



79

E. Zebra. Zebra.

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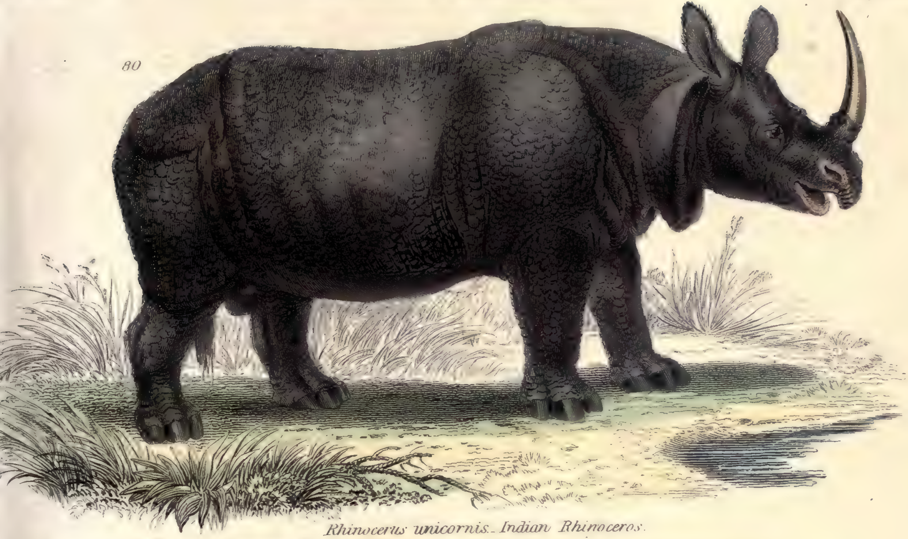
MAMMALIA.

rder Pachydermata.

Genera Rhinocerus, Hippopotamus, Tapirus.

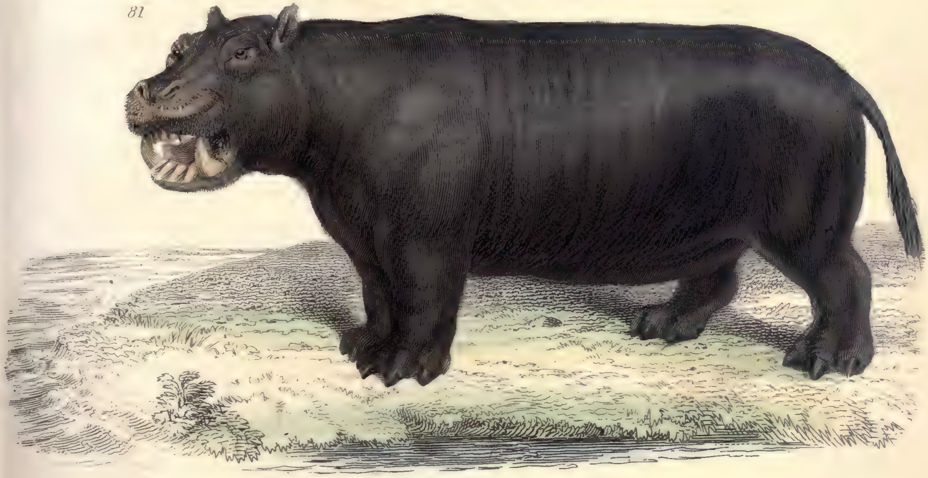
Families { Rhinoceridæ, Hippopotamidæ, Tapiridæ.

80



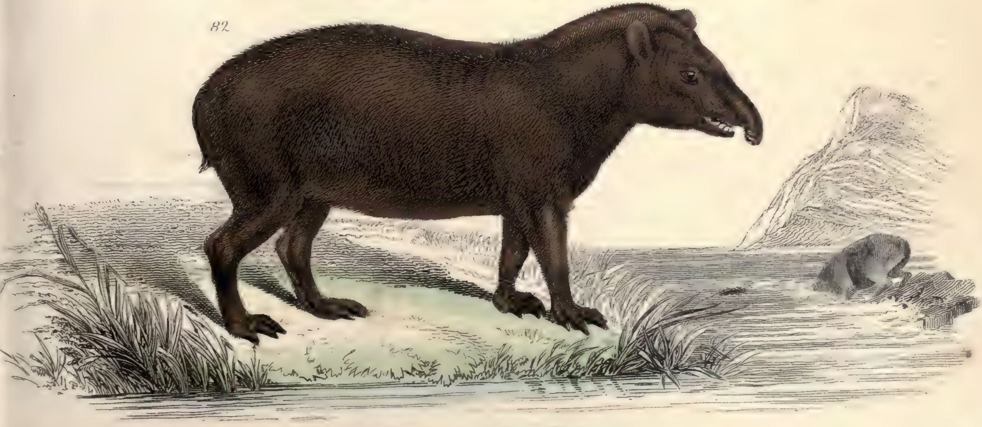
Rhinocerus unicornis.—Indian Rhinoceros.

81



Hippopotamus amphibius.—Hippopotamus.

82



Tapirus Americanus.—American Tapir.

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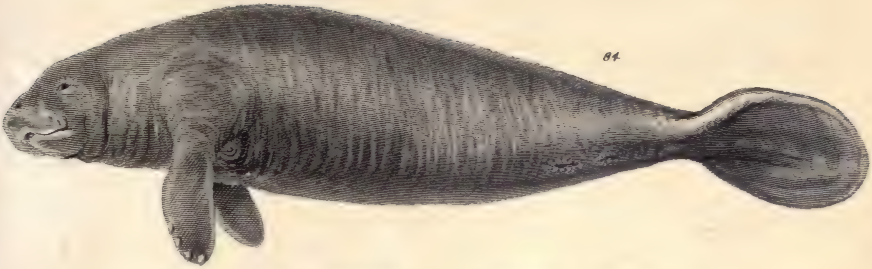
MAMMALIA.

PLATE 26

Order. Cetacea.

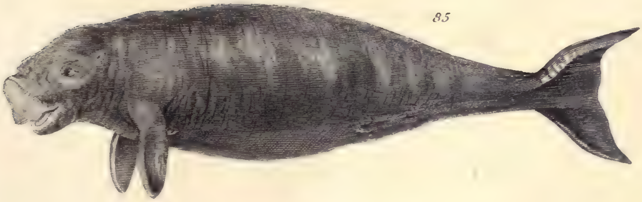
Genera. Manatus Halicore. Rhytina

Families {Manatidæ
Rhytinidæ



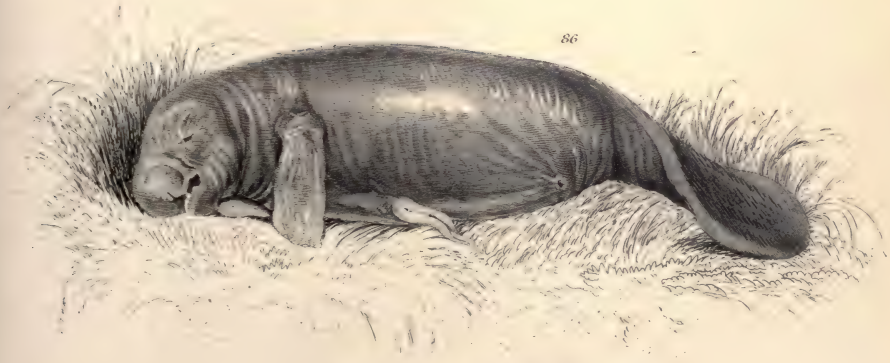
84

M. Australis. —— *American Manatee.*



85

H. Dugong. —— *Dugong.*



86

R. Stelleri —— *Steller's Rhytina. (Young)*

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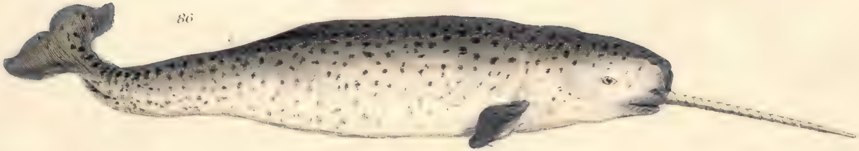
MAMMALIA

Order Cetacea.

Genera Monodon, Physeter.

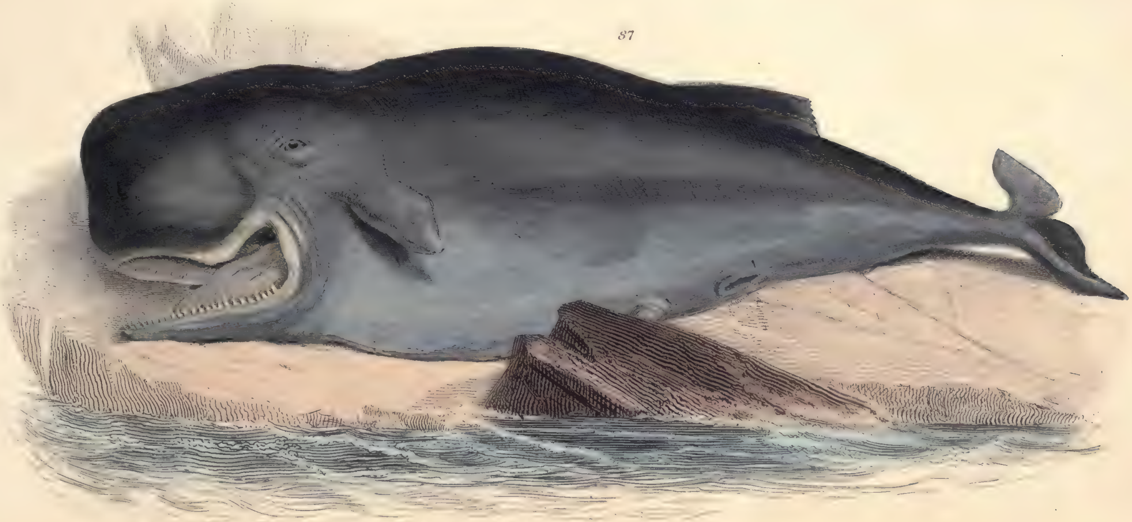
Families Delphinidæ.
Physeteridæ.

86



M. Monoceros. —— *Narwhal*

87



P. Macrocephalus. —— *Cachalot or Spermaceti Whale.*

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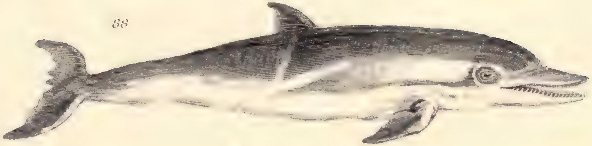
MAMMALIA

Order Cetacea.

Genera. Delphinus Balæna.

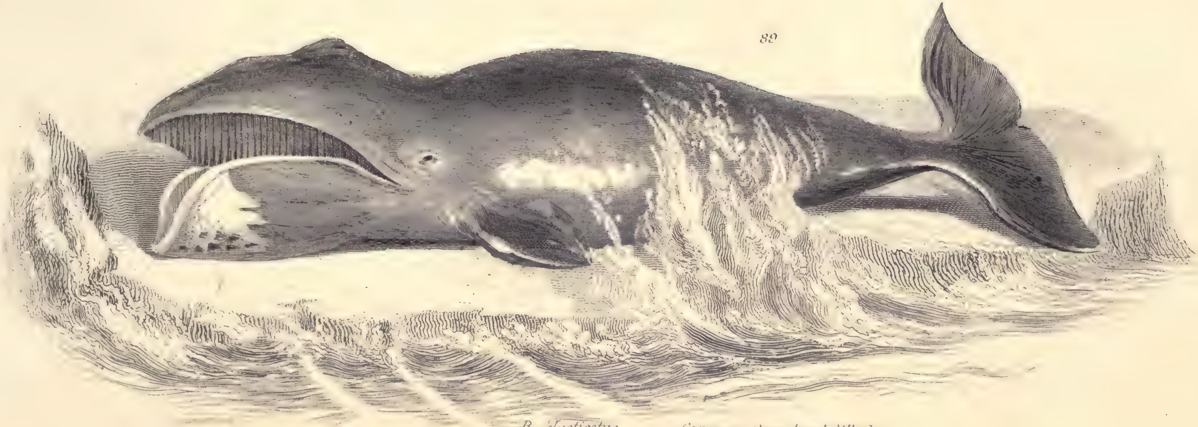
Families Delphinidæ.
Balænidæ.

88



D. Delphis._ Dolphin

89



B. Mysticetus ____ *Common Greenland Whale*.

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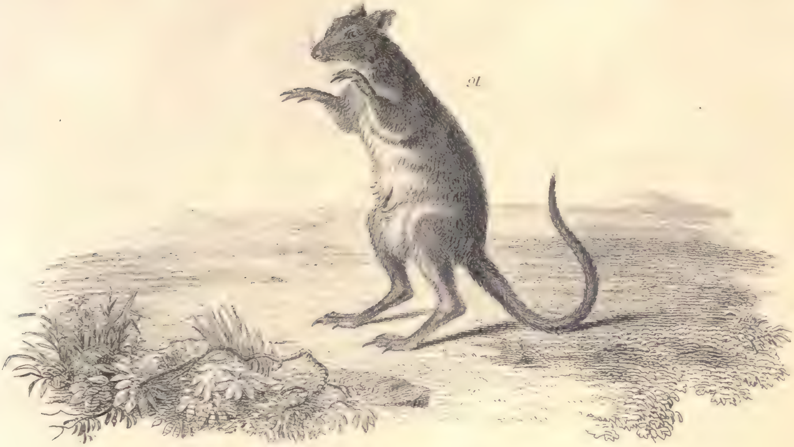
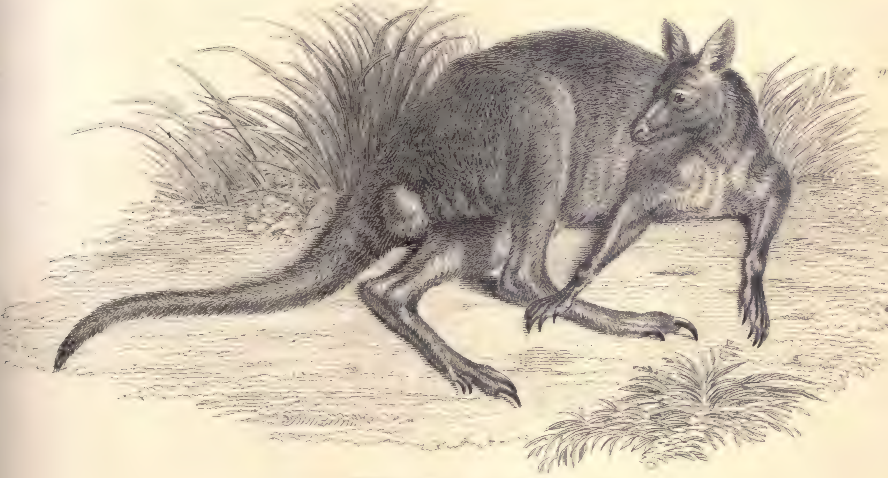
PLATE 29

MAMMALIA.

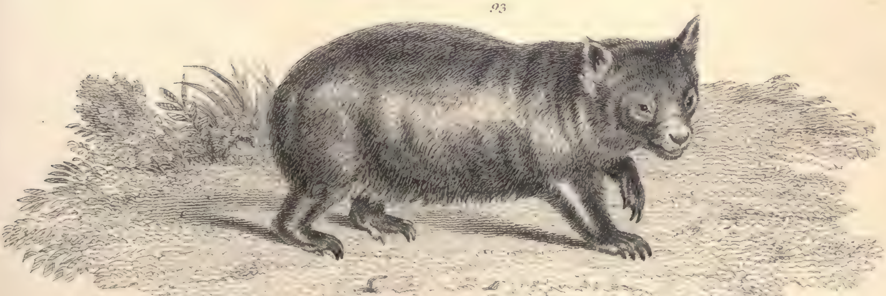
Order. Marsupialia. *Genera.* Hypsyprymnus Macropus, & Phascolomys. *Families* { Macropodidæ / Phascolomydæ



Hyps. minor _ Potoroo, or Kangaroo Rat.



M. Giganteus _ Great Kangaroo.



P. ursinus _ Wombat.

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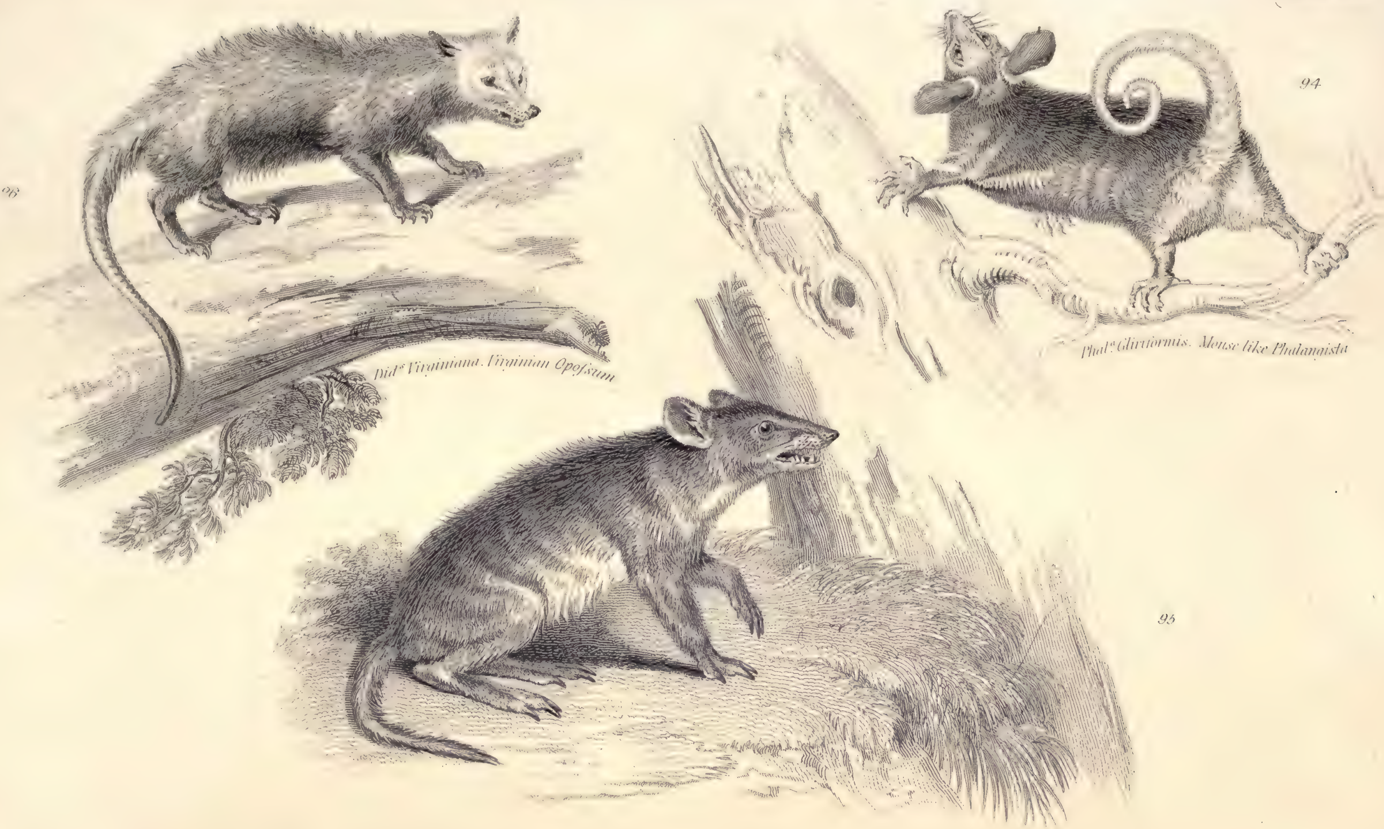
MAMMALIA.

Order: Marsupialia.

Genera. Phalangista. Perameles. Didelphis.

Families
Phalangistidæ.
Peramelidæ.
Didelphidæ.



94 *Phal^a Gliriformis. Mouse like Phalangista*

95 *Per^s Obesula. Spiny Bandicoot.*

96 *Did^s Virginiana. Virginian Opoſsum*

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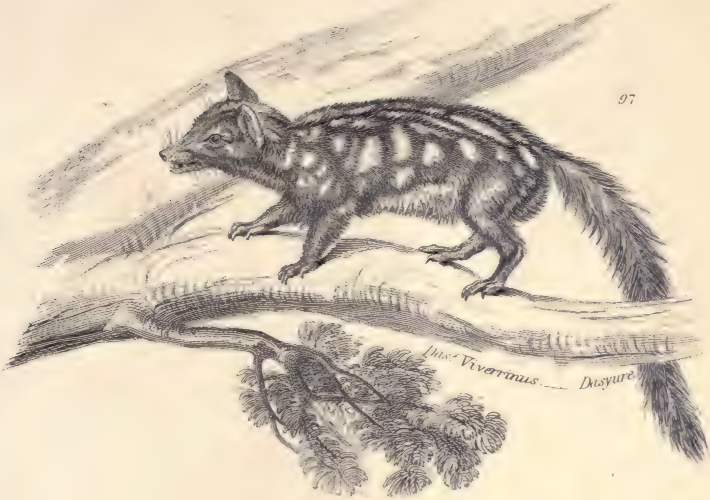
MAMMALIA.

Order. Marsupialia.

Family. Dasyuridæ.

Genera. Dasyurus.

97



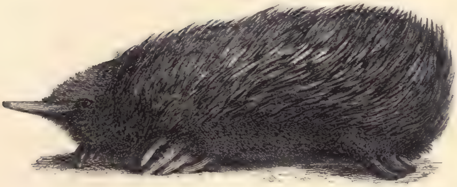
Das.s Viverrinus.— Dasyure.

Order. Monotremata.

Genera. Echidna, Platypus.

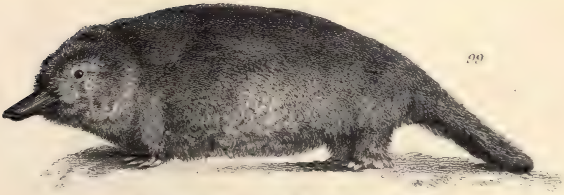
Families { Echidnidæ.
Ornithorhynchidæ.

98



E. Hystrix. Porcupine Ant-eater.

99



P. Anatinus. Duck-billed Platypus.

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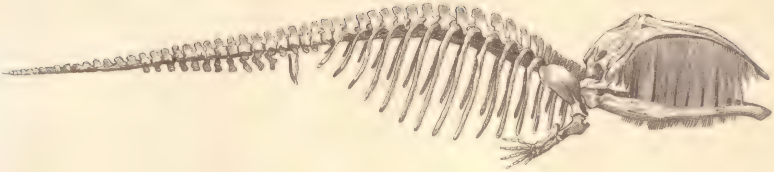
MAMMALIA.

PLATE 32

Order Cetacea. *Genera*. Balæna. *Family*. Balænidæ.

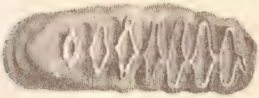
90



B Mysticetus. —— *Skeleton of Greenland Whale.*

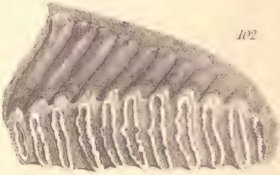
Order. Pachydermata. *Genus*. Mastodon.

101



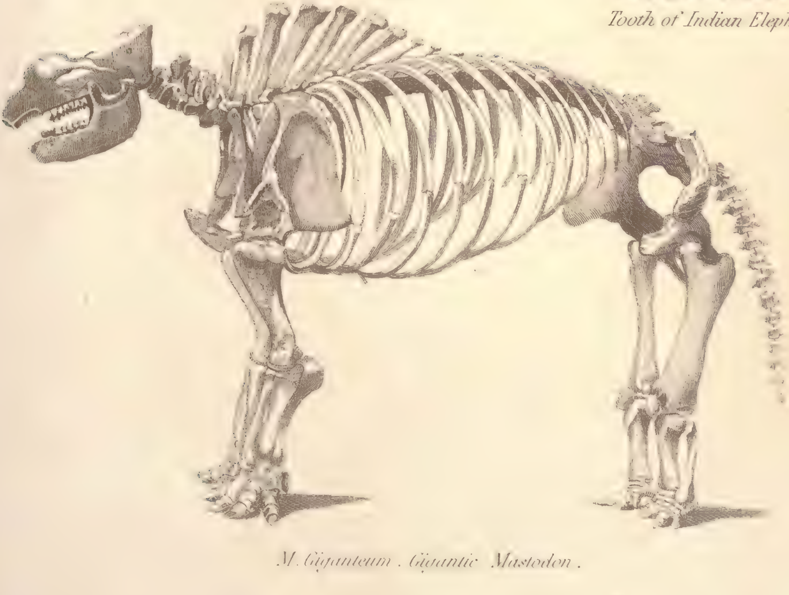
Tooth of African Elephant.

102



Tooth of Indian Elephant.

100

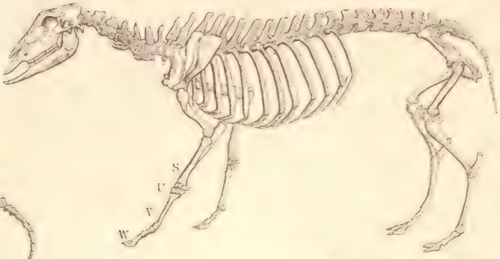


M. Giganteum. Gigantic Mastodon.

WILLIAM MACKENZIE LONDON EDINBURGH & GLASGOW.

MAMMALIA.

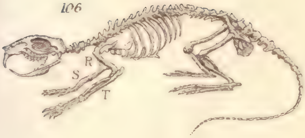
SKELETON OF BEASTS



103

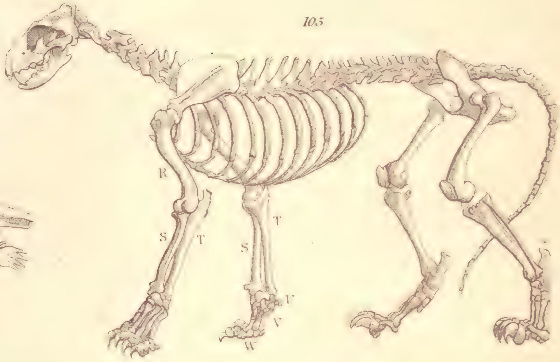
Ovis *aries. Sheep*

106



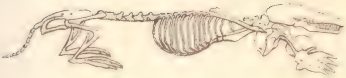
Mus *rattus. Black Rat.*

105

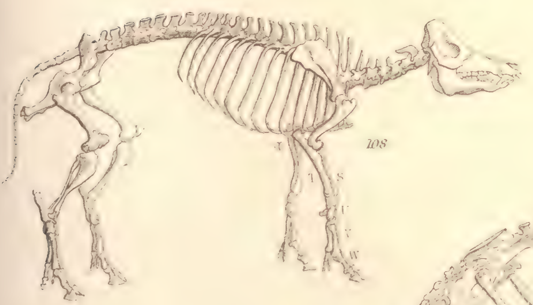


Felis *leo. Lion.*

104



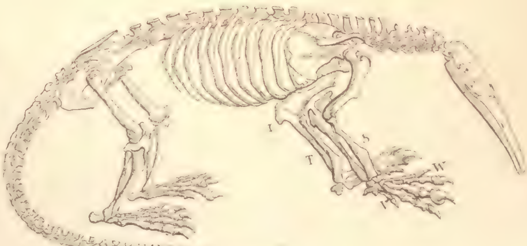
Talpa *Europæa. Male.*



108

Sus *scrofa. Hog.*

107

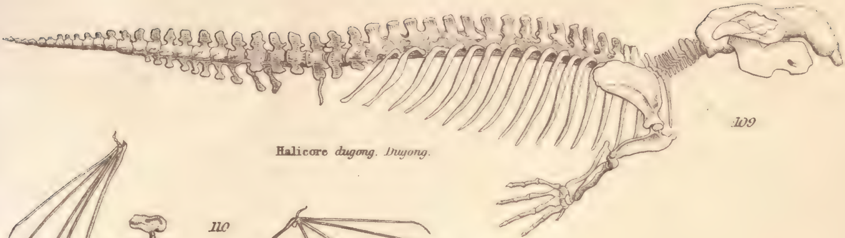


Myrmecophaga *jubata. Great Ant eater.*

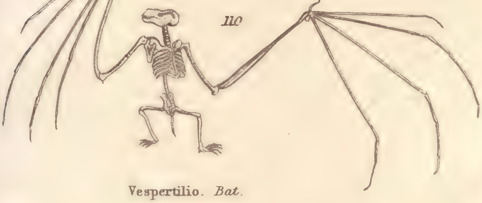
[illegible]

MAMMALIA.

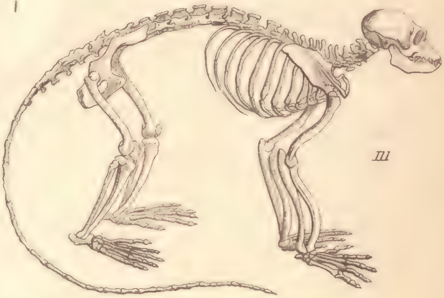
SKELETONS OF BEASTS


109

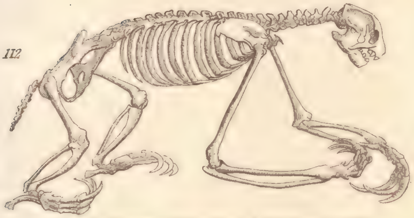
Halicore *dugong. Dugong.*


110

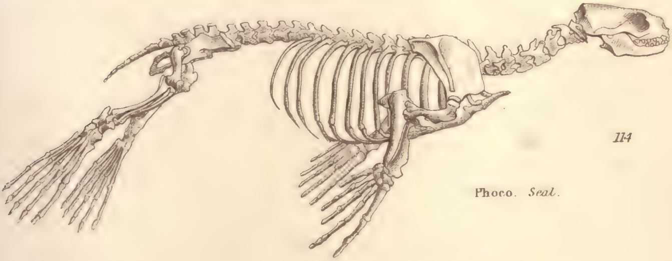
Vespertilio. *Bat.*


111

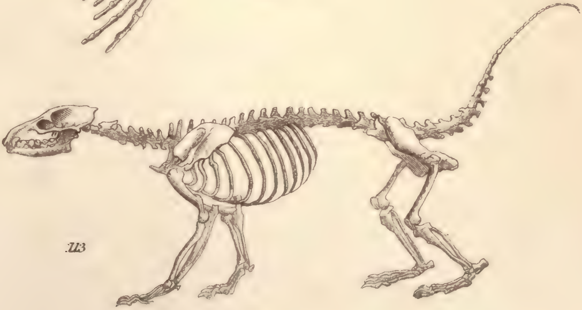
Semnopithecus *maurus. Lotong.*


112

Bradypus *tridactylus. Three toed Sloth.*


114

Phoco. *Seal.*


113

Nasua *fusca. Coati mondi.*

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BIRDS

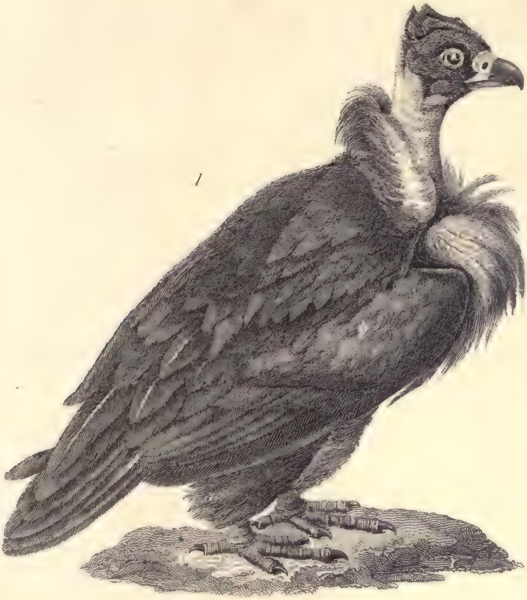
PLATE I.

Order. Accipitres.

Family Vulturidæ

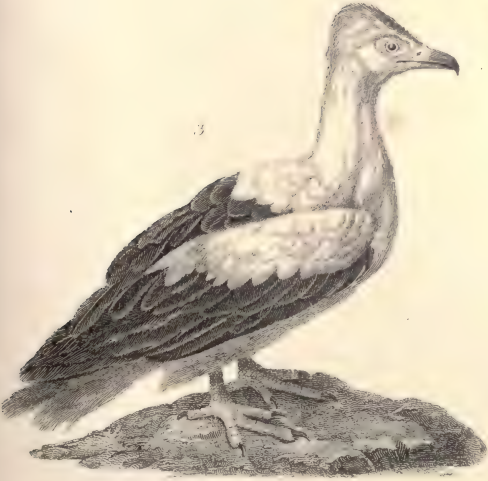
Genera. Vultur Sarcorhamphus. Neophron

1



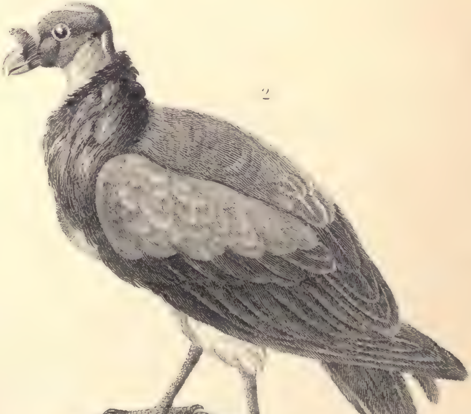
Vultur Monachus Arabian Vulture.

3



Neophron Percnopterus Egyptian Vulture.

2



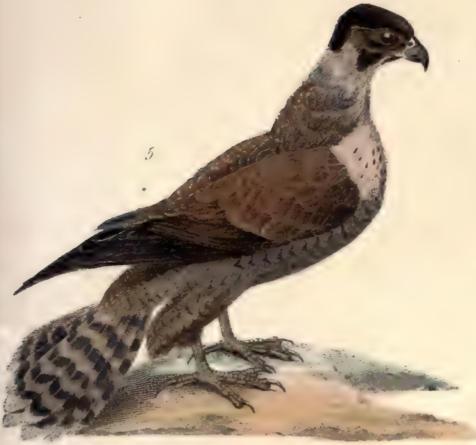
Sarcorhamphus Papa. King Vulture.

Order. Accipitres.

Genera Gypaetos Falco, Spizaëtus.

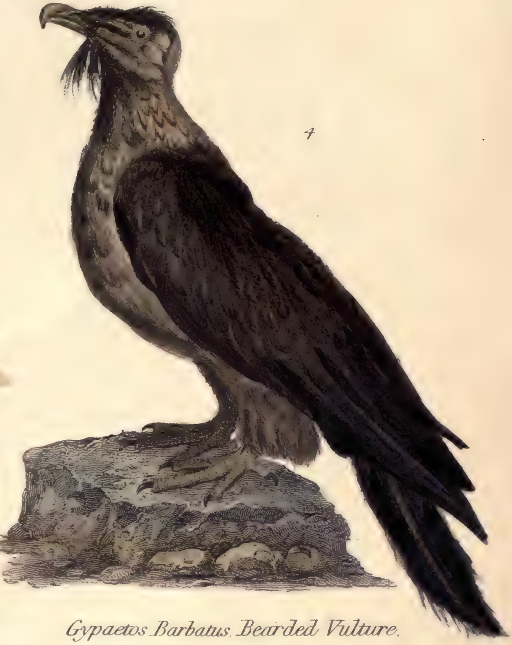
Families Vulturidæ.
Falconidæ.

5



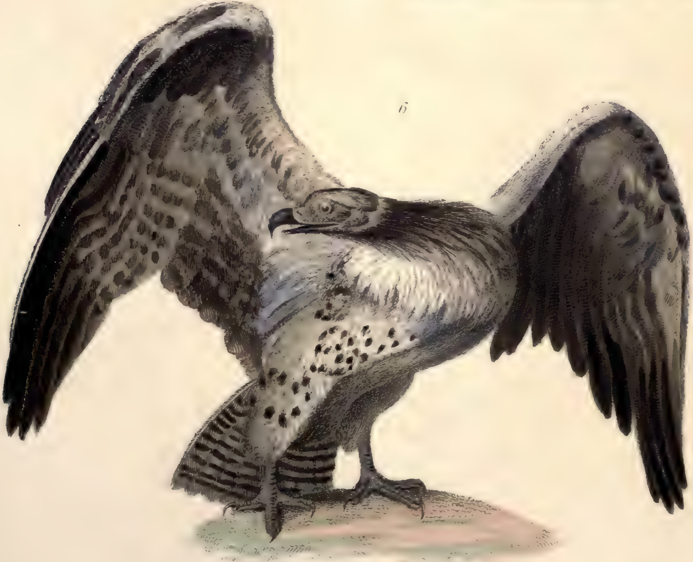
Falco Berigora: Cream-bellied Falcon.

4



Gypaetos Barbatus. Bearded Vulture.

6



Spiz. Bellicosus Martial Eagle.

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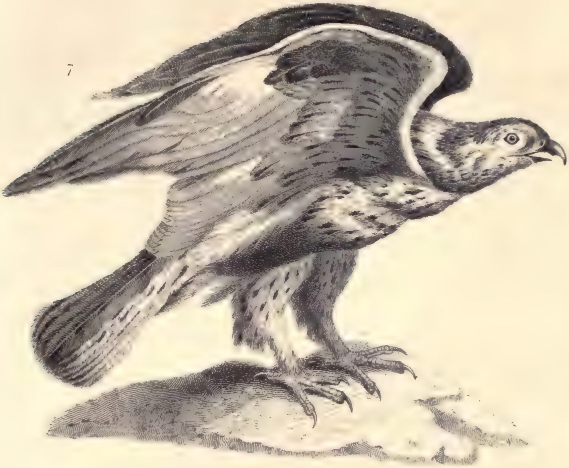
BIRDS

Order, Accipitres.

Genera Buteo. Serpentarius. Syrnium.

Families { Falconidæ.
Strigidæ.

7

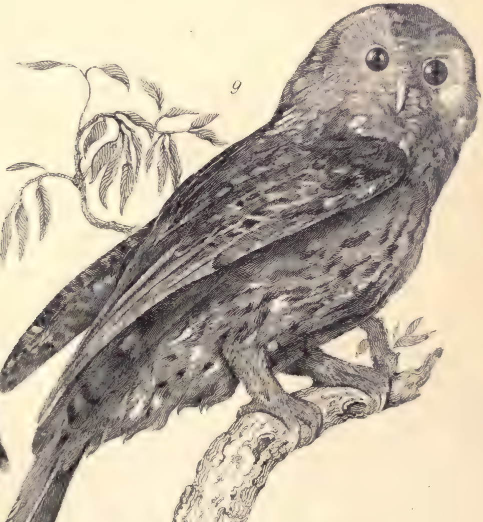


Buteo Lagopus. Rough-legged Buzzard.

8

Serp. Reptilivorus. Secretary Bird.

9



Syrnium. aluco. Brown Owl.

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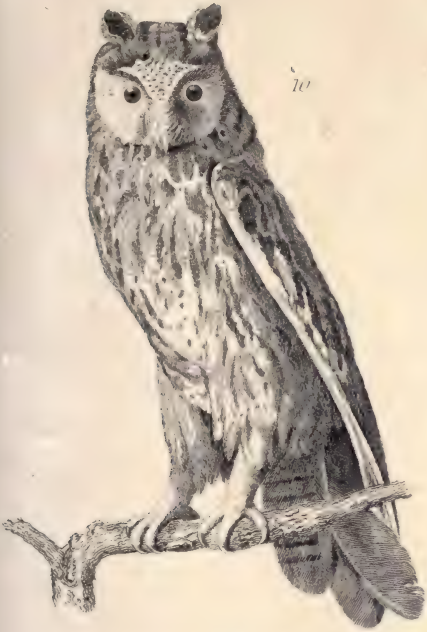
BIRDS

PLATE 4

Order. Accipitres.

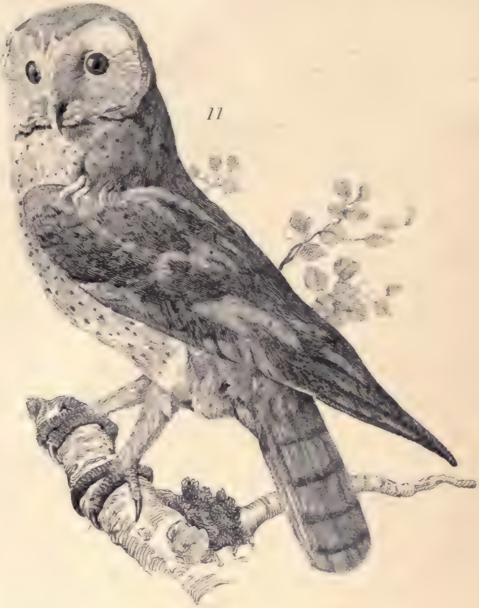
Genera. Otus. Strix. Surnia.

Family. Strigidæ.



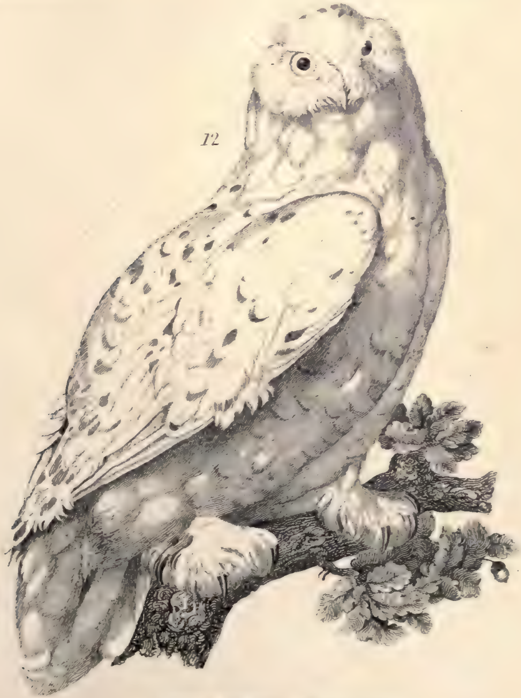
10

Otus. vulgaris. Long Eared Owl.



11

Strix Flammea. Barn Owl.



12

Surnia. nyctea. Snowy Owl.

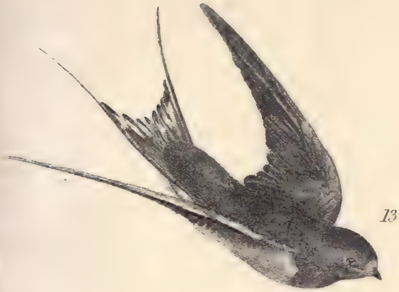
BIRDS

PLATE 5

Order. Passeres

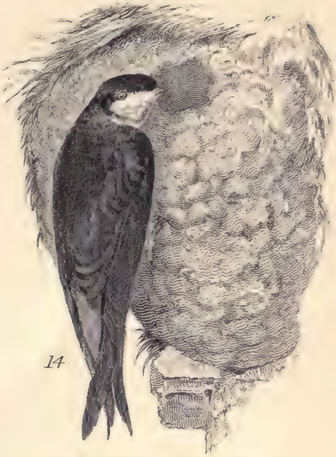
Genera Hirundo Cypselus. Collocalia

Families Hirundinidæ.
Cypselidæ.



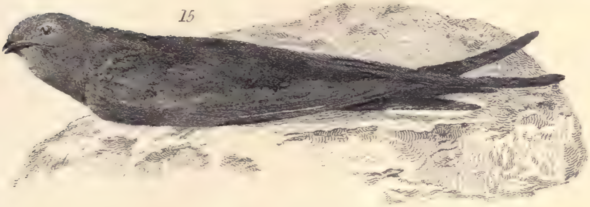
13

H. Rustica . Chimney Swallow.



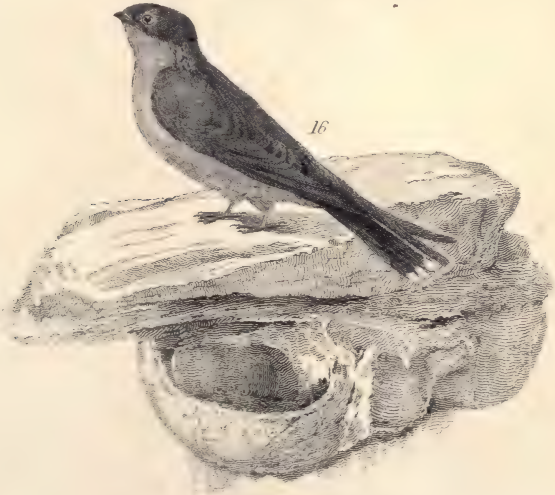
14

H. Urbica . House Martin .



15

Cyp. Apus. Common Swift.



16

Col. Esculenta . Esculent Swallow.

[illegible] EDINBURGH & GLASGOW

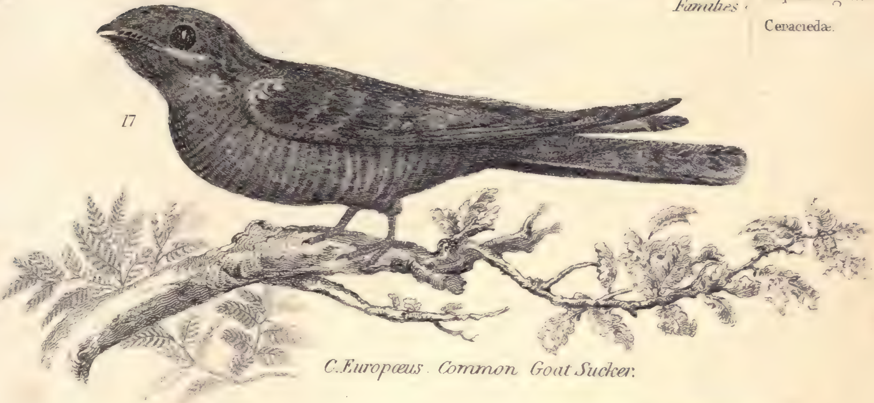
BIRDS

PLATE 6

Genera Caprimulgus. Macrodipteryx Eurylaimus.

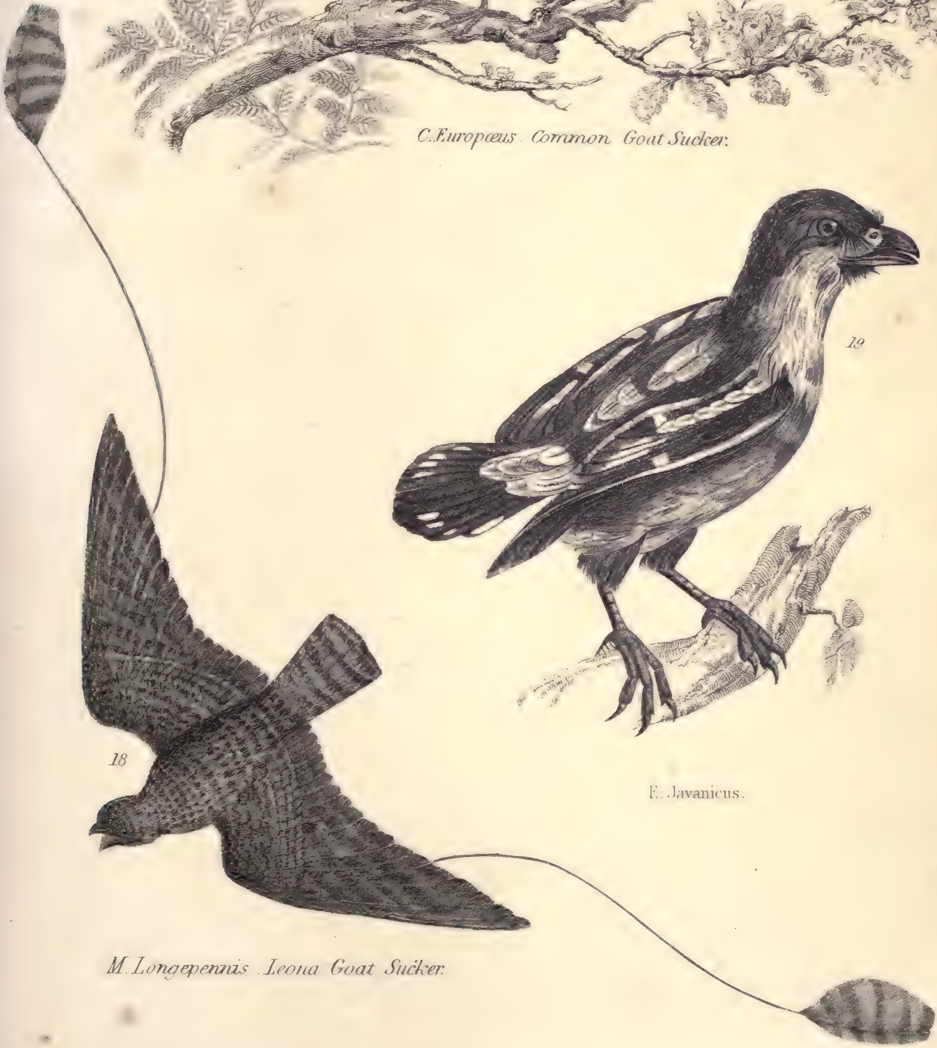
Order. Passeres.

Families. Caprimulgidæ
Ceracidæ.



17

C. Europœus. Common Goat Sucker.



19

E. Javanicus.

18

M. Longepennis. Leona Goat Sucker.

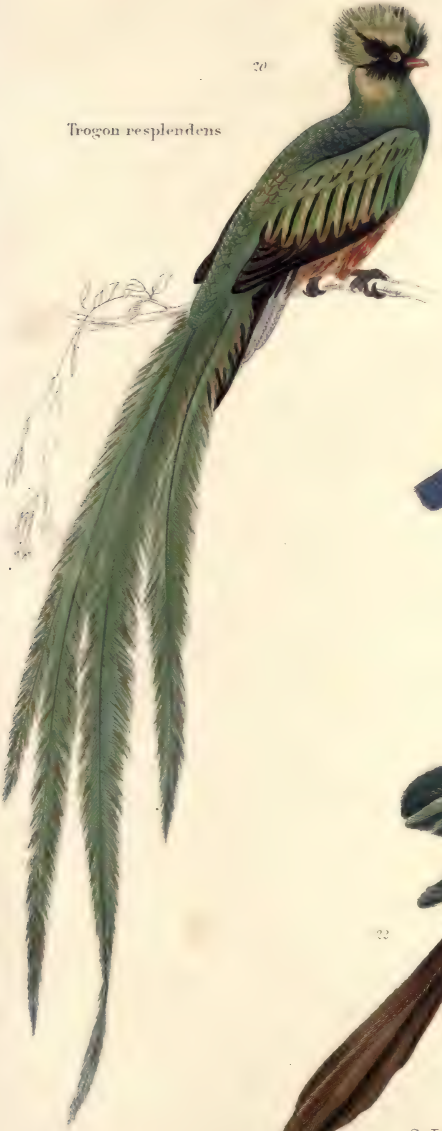
WILLIAM MACKENZIE, GLASGOW, EDINBURGH & LONDON.

Order. Passeres

Genera. Trogon Alcedo. Galbula

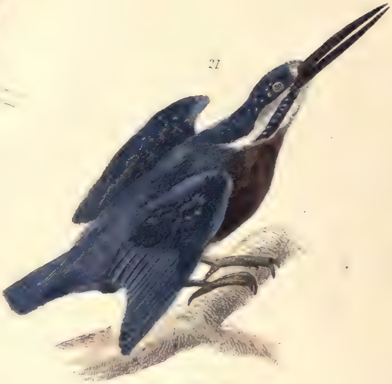
Families Trogonidæ
Alcedinidæ

20



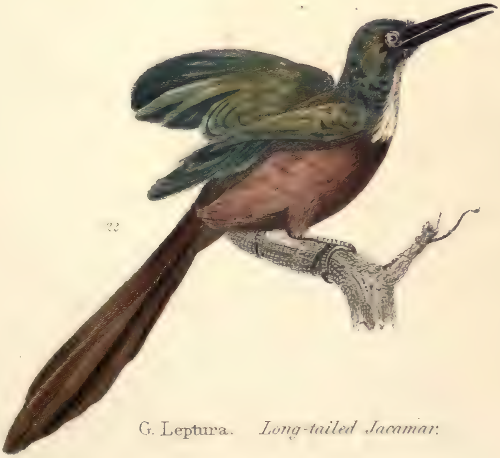
Trogon resplendens

21



A. Ispida. *Kingfisher.*

22



G. Leptura. *Long-tailed Jacamar.*

WILLIAM MACKENZIE GLASGOW EDINBURGH & LONDON

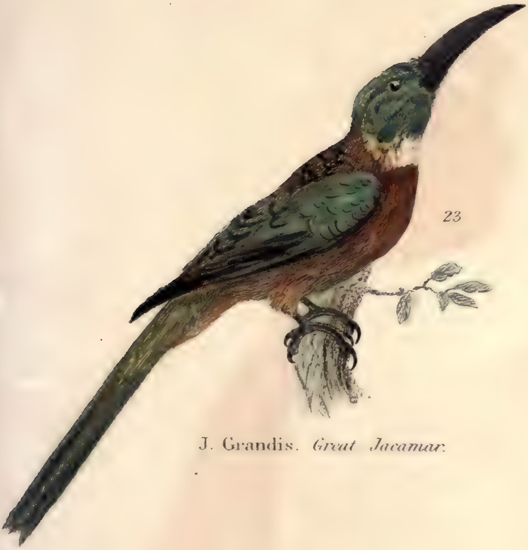
BIRDS

PLATE. 8

Genera. Jacamerops. Merops. Upupa. Trochilus.

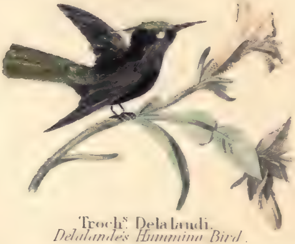
Order. Passeres

Families { Alcedinidæ
Meropidæ
Upupidæ
Trochilidæ.



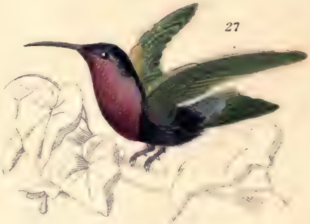
23

J. Grandis. *Great Jacamar.*



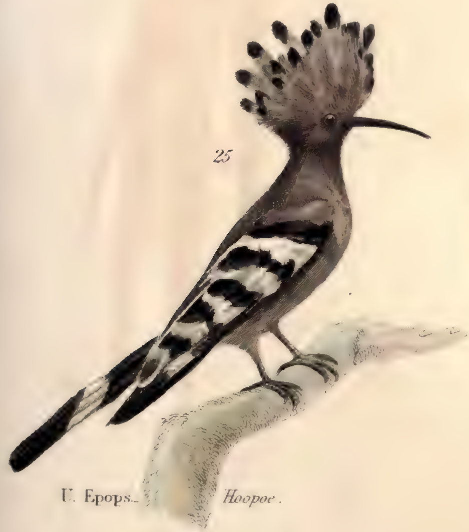
26

Troch^s. Delalandi.
Delalande's Humming Bird.



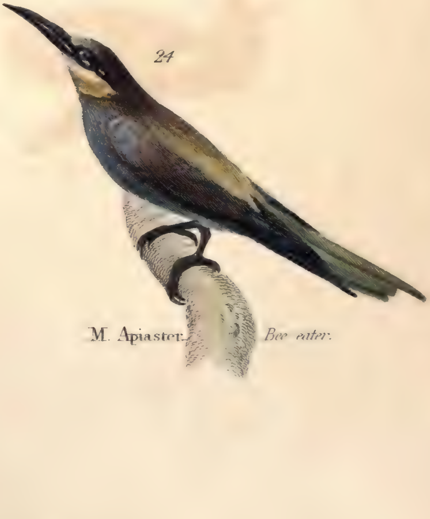
27

Trochilus granatinus



25

U. Epops. *Hoopoe.*



24

M. Apiaster. *Bee eater.*

WILLIAM MACKENZIE, GLASGOW, EDINBURGH, LONDON.

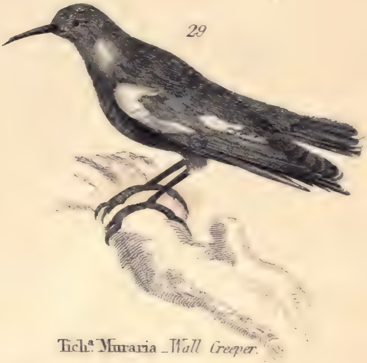
BIRDS

PLATE. 9

Order. Passeres.

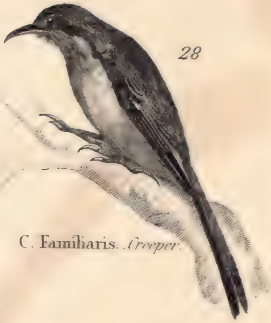
Genera. Certhia. Tichodroma. Sitta. Menura.

Family. Certhiadæ.



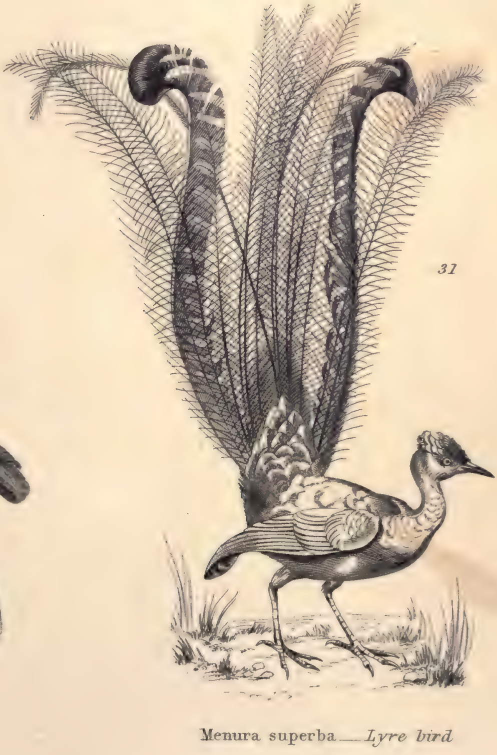
29

Tichª Muraria _ *Wall Creeper.*



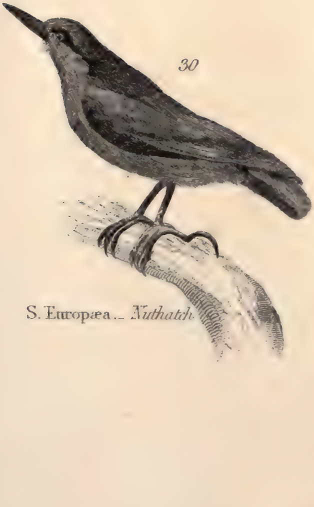
28

C. Familiaris. *Creeper.*



31

Menura superba __ *Lyre bird*



30

S. Europæa _ *Nuthatch.*

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BIRDS

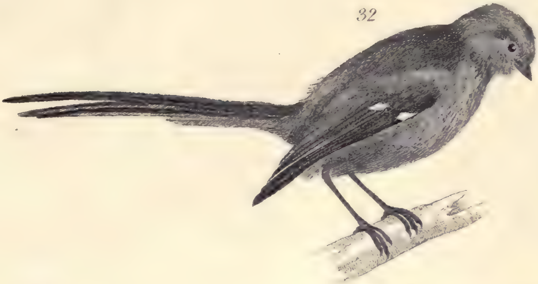
Plate 10

Genera Mecistura. Erythacus. Mimus. Muscicapa.

Order. Passeres

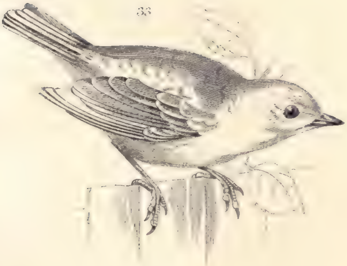
Families Sylvridæ.
Turdidæ.
Muscicapidæ.

32



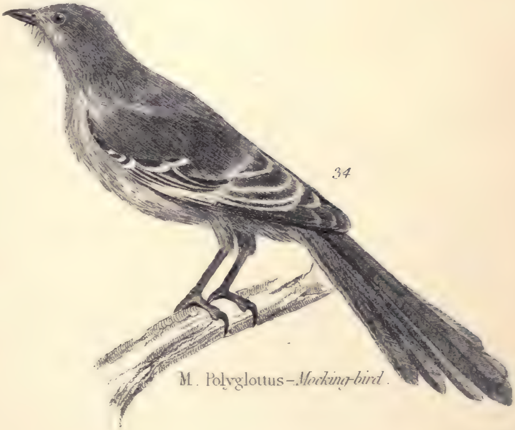
M. Candata.—*Long tailed Titmouse.*

33



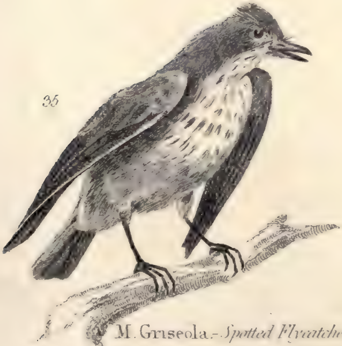
Erythacus rubecula.—*Red-breast*

34



M. Polyglottus–*Mocking-bird.*

35



M. Griseola.–*Spotted Flycatcher.*

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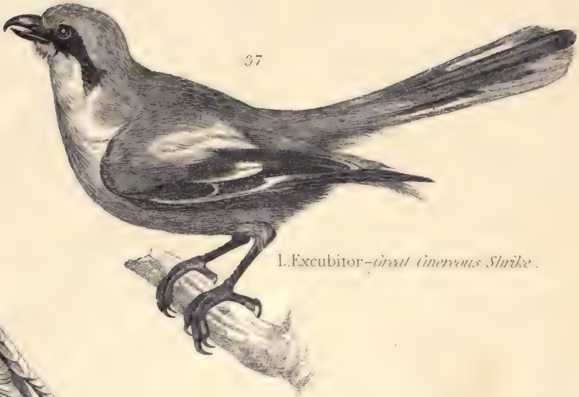
BIRDS

PLATE II.

Order. Passeres.

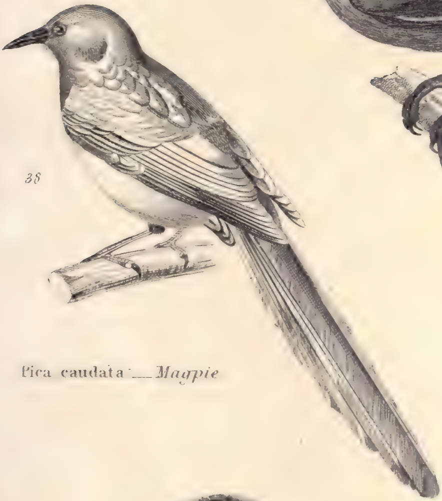
Genera. Rupicola. Lanius. Pica

Families Ampelidæ.
Laniidæ.
Cowidæ



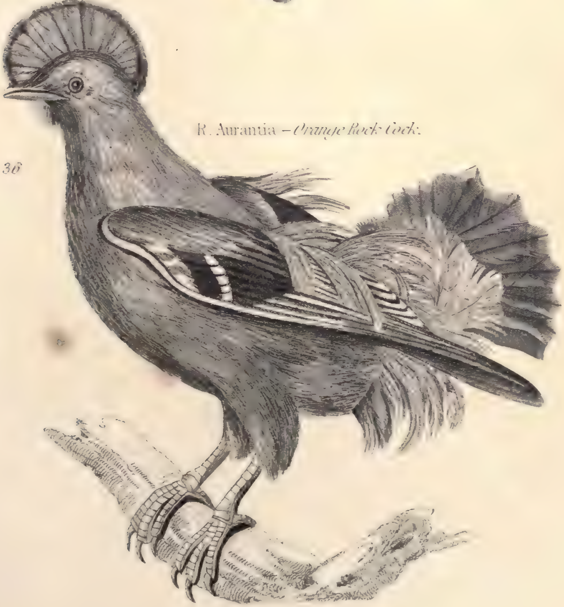
37

L. Excubitor–*Great Cinereous Shrike.*



38

Pica caudata.—*Magpie*



R. Aurantia –*Orange Rock Cock.*

36

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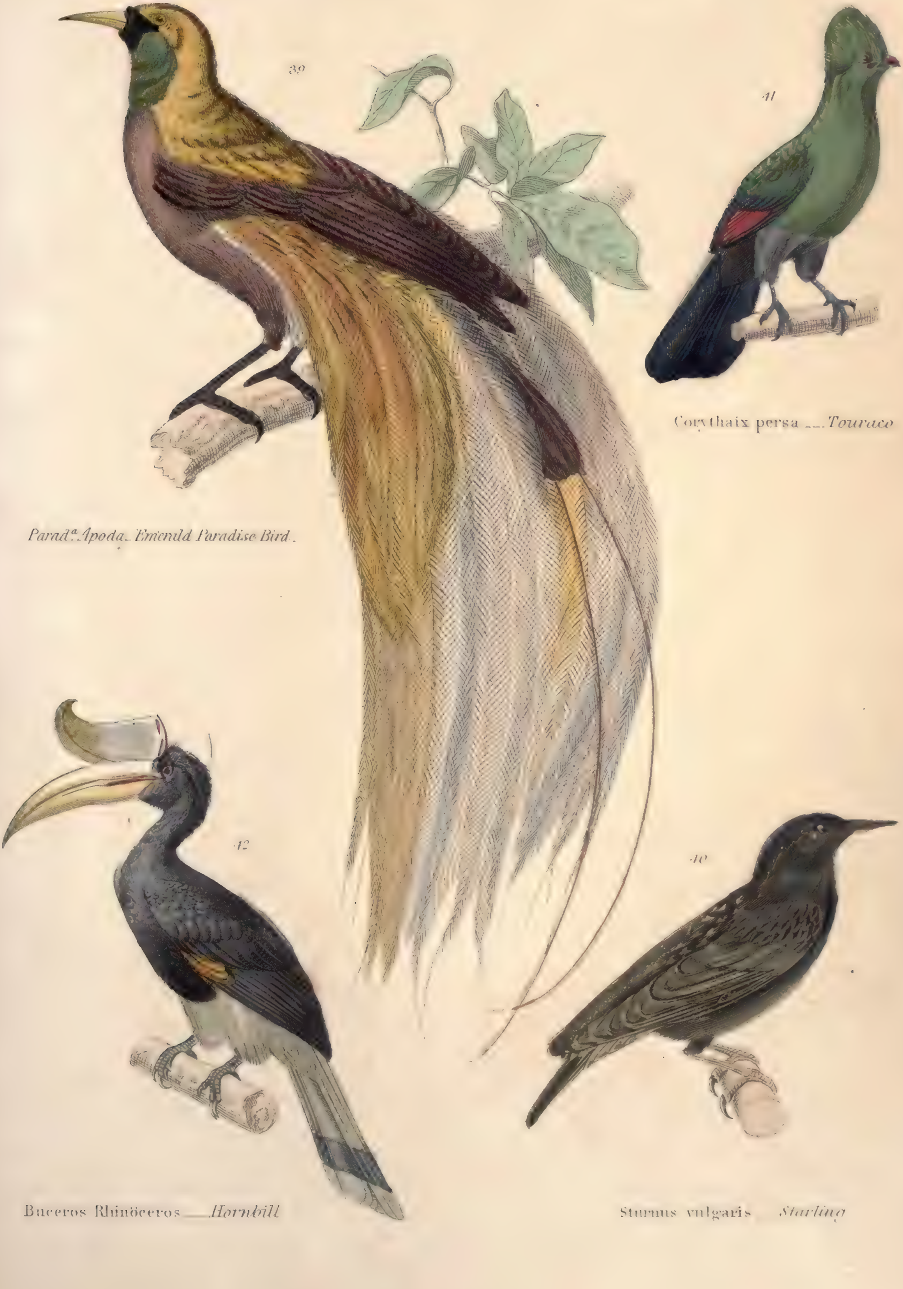
BIRDS

PLATE 12

Order. Passeres

Genera. Paradisea. Sturnus Corythaix Buceros

Families Paradiseidæ
Sturnidæ
Musophagidæ
Bucerotidæ



Parad^a. Apoda_ Emerald Paradise Bird.

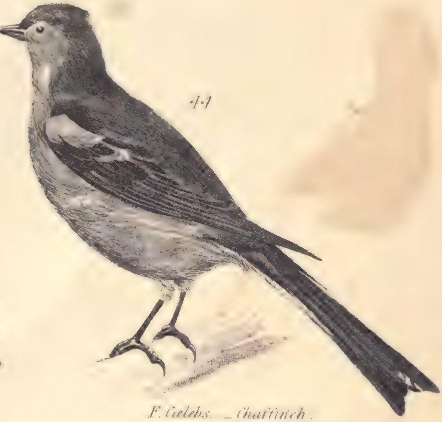
Corythaix persa ___ *Touraco*

Buceros Rhinöceros ___ *Hornbill*

Sturnus vulgaris ___ *Starling*

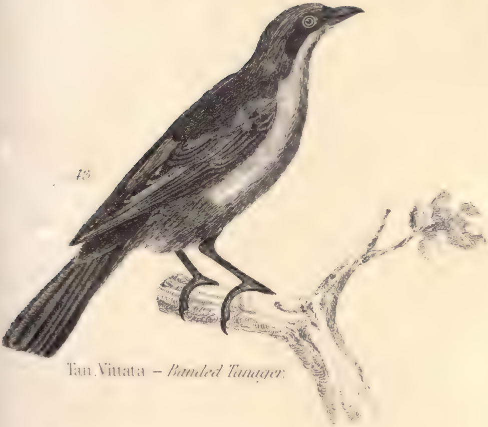
[illegible]

Order. Passeres. *Genera.* Lanius. Fringilla Emberiza Alauda *Family* Fringillidæ



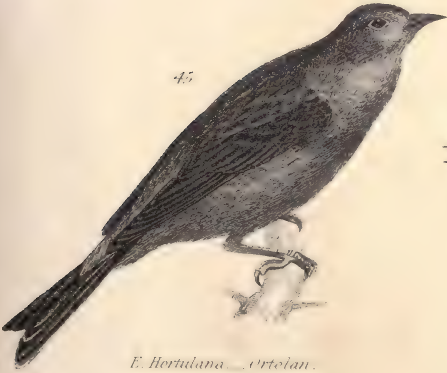
44

F. Cœlebs. _ Chaffinch.



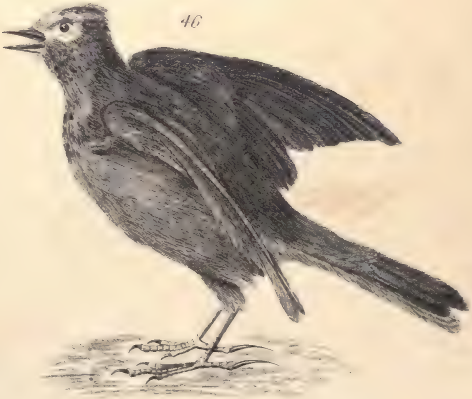
43

Tan. Vittata – *Banded Tanager.*



45

E. Hortulana. _ Ortolan.



46

A. Arvensis. Skylark.

[illegible]

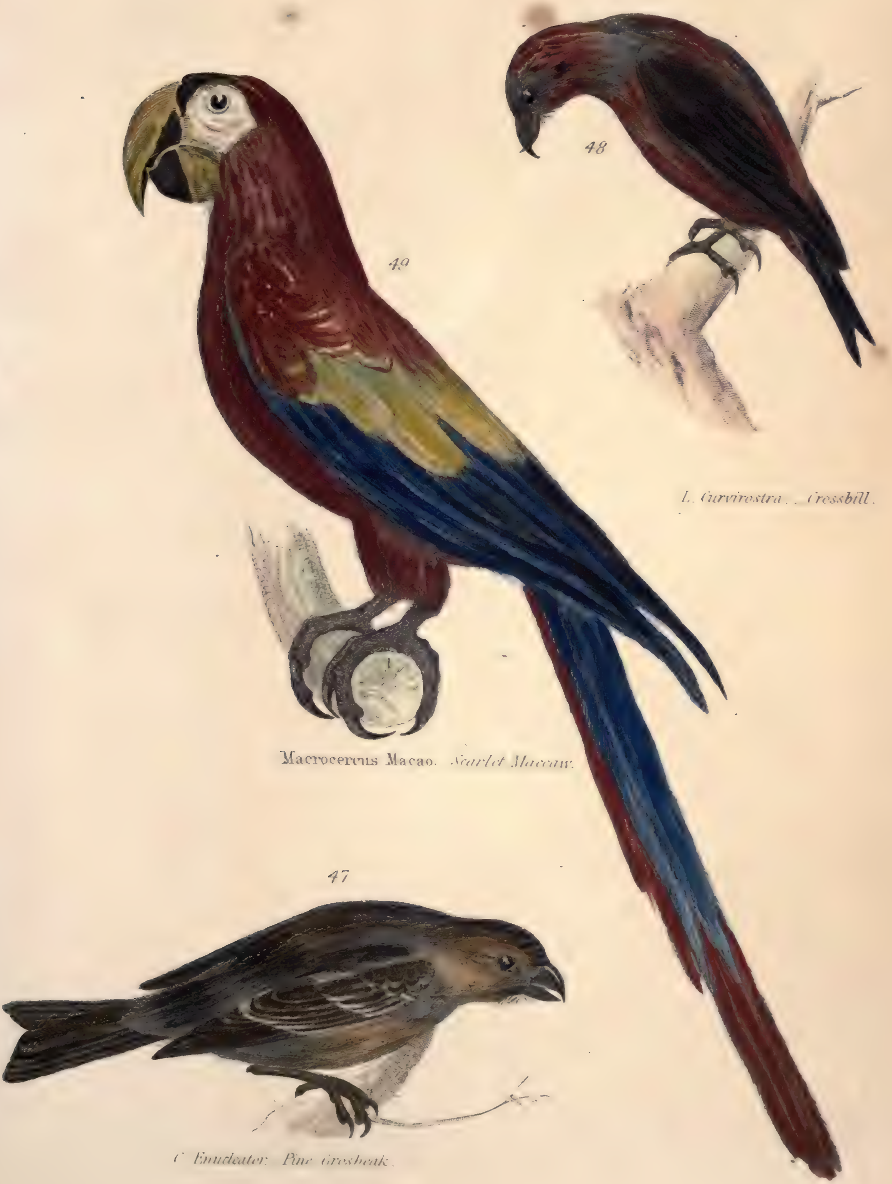
BIRDS

PLATE 14

Order. Passeres
Scansores.

Genera. Pinicola Loxia Macrocercus.

Families Fringillidæ.
Psittacidæ.



48

L. Curvirostra. Cressbill.

49

Macrocercus Macao. *Scarlet Maccaw.*

47

C. Enucleator. Pine Grosbeak.

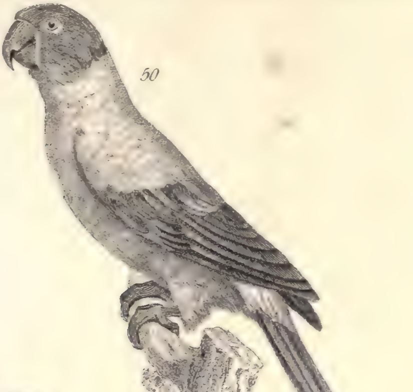
[illegible]

BIRDS

Order. Scansores.

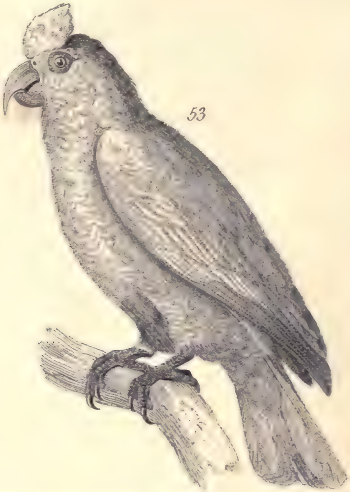
Family. Psittacidæ.

Genera. Conurus. Psittacula. Psittacus. Licmetis. Microglossum.



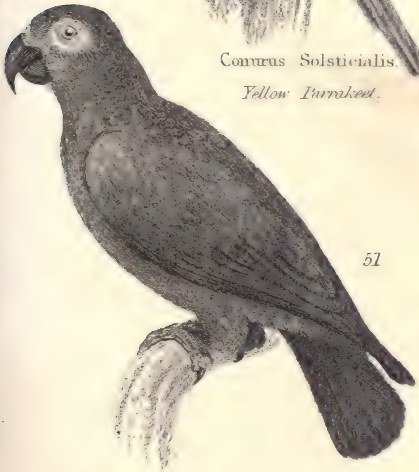
50

Conurus Solsticialis. *Yellow Parrakeet.*



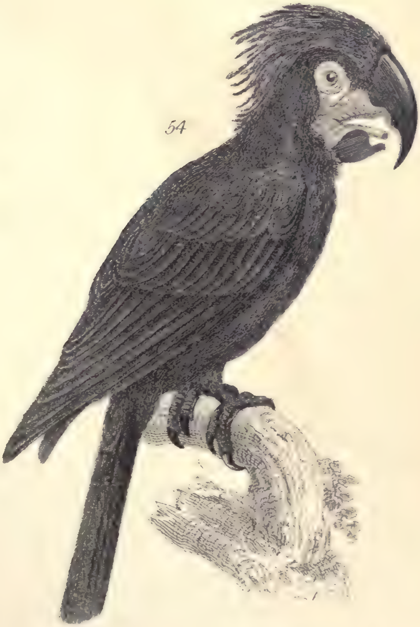
53

Licmetis Tenuirostris. *Long-nosed Cockatoo.*



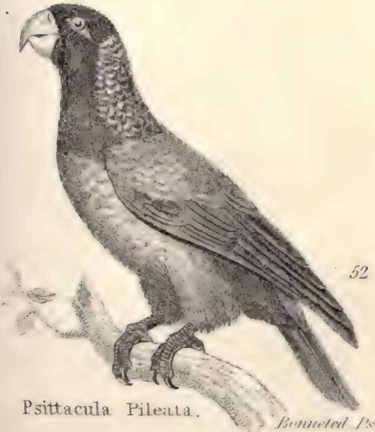
51

Psittacus Erythacus. *Grey Parrot.*



54

Microglossum Aterrimum. *Grey Small-tongued Parrot.*



52

Psittacula Pileata. *Bonneted Psittacule.*

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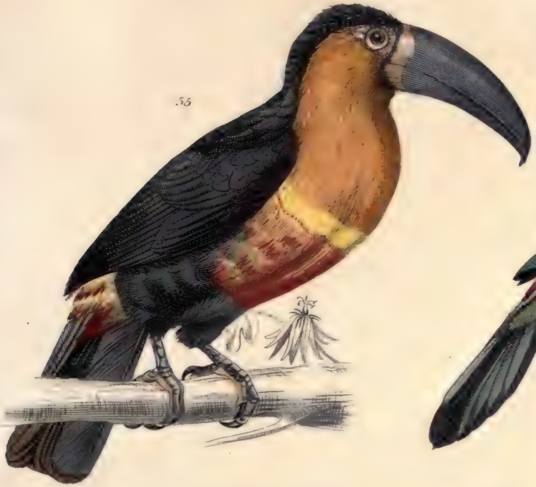
Order: Scansores.

Genera Rhamphastos, Pteroglossus. Picus. Picoides.

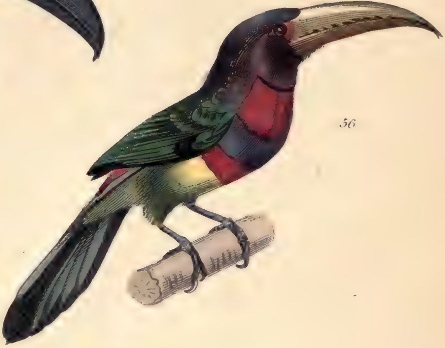
Families Rhamphastida
Picidæ

55



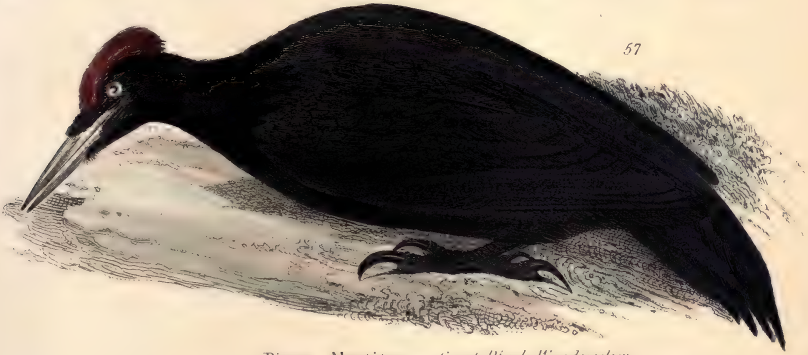
Rhamphastos dicolorus.— *Red breasted Toucan*

56



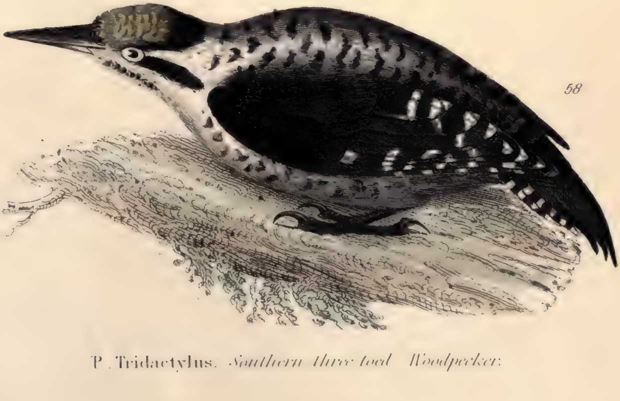
Pteroglossus aracari — *Anacari*

57



Picus Martius. *Great Black Woodpecker.*

58



P. Tridactylus. *Southern three toed Woodpecker.*

WILLIAM MACKENZIE, GLASGOW, EDINBURGH & LONDON

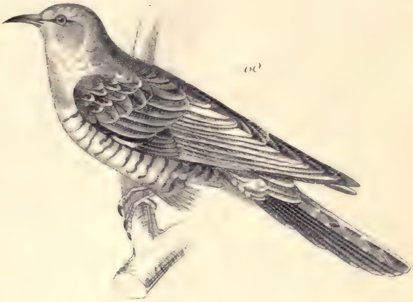
BIRDS

PLATE 17.

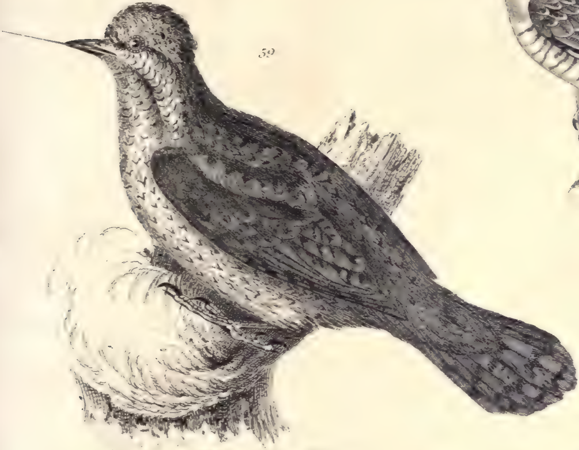
rders Scansores. Columbae.

Genera. Yunx. Cuculus. Columba. Carpophaga.

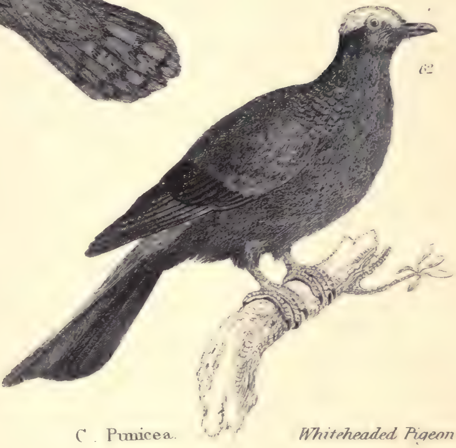
Families Picidæ. Cuculidæ. Columbidæ.



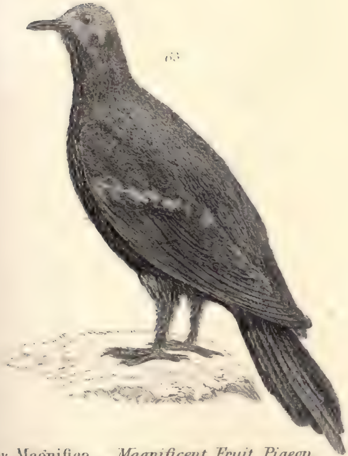
Cuculus canorus — *Cuckoo*



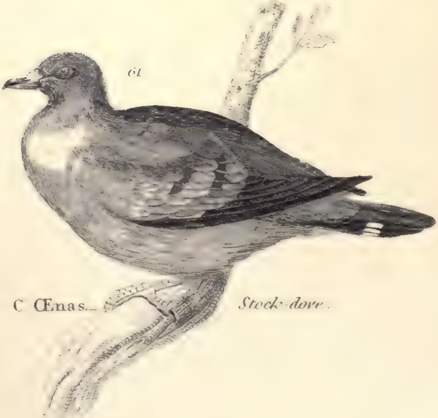
Y. Torquilla. *Wryneck.*



C. Punicea. *Whiteheaded Pigeon*



Car. Magnifica — *Magnificent Fruit Pigeon.*



C. Œnas — *Stock-dove.*

WILLIAM MACKENZIE, LONDON, EDINBURGH & GLASGOW.

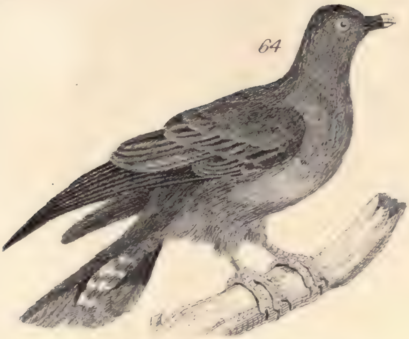
BIRDS

Plate 18

Order. Columbäe.
Gallinæ.

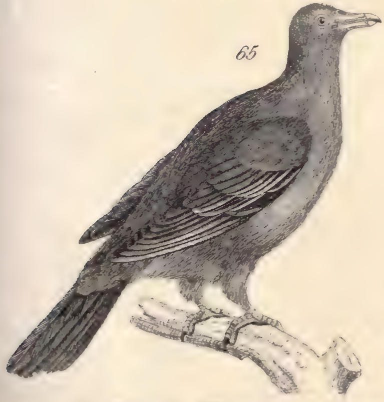
Genera. Treron. Goura. Gallus. Ceriornis.

Family. Columbidæ.
Phasianidæ.



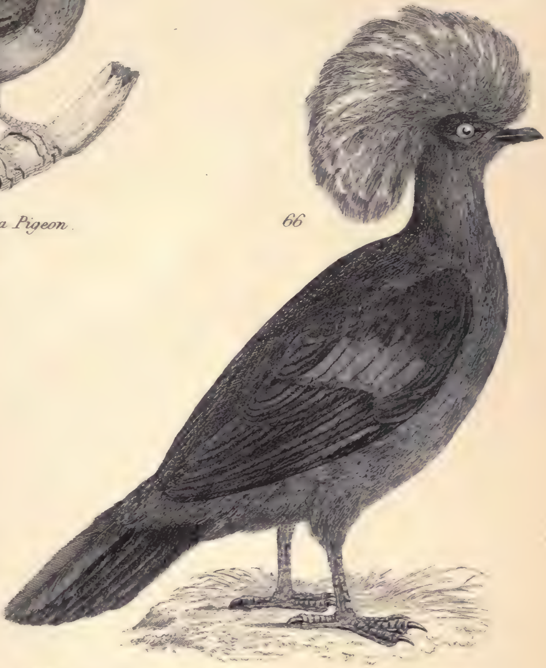
64

T. Abyssinica. *Waalia Pigeon*.



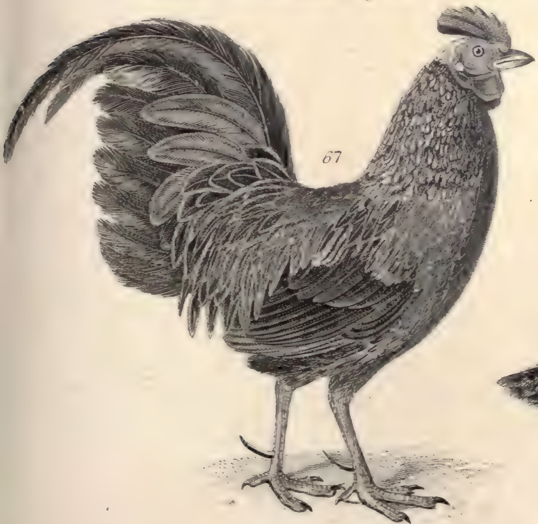
65

T. Sieboldii. *White-booted Pigeon*.



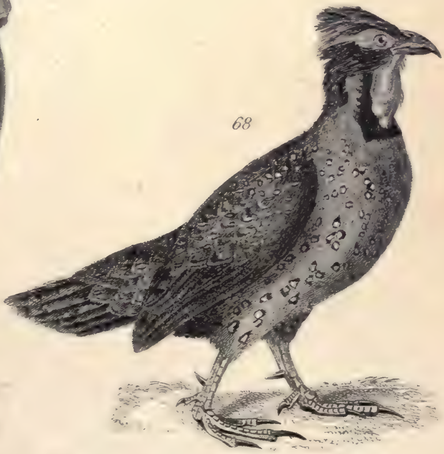
66

G. Coronata. *Crowned Pigeon*.



67

G. Bankivus. *Domestic Cock*.



68

C Satvras. *Nepaul Horned Pheasant*.

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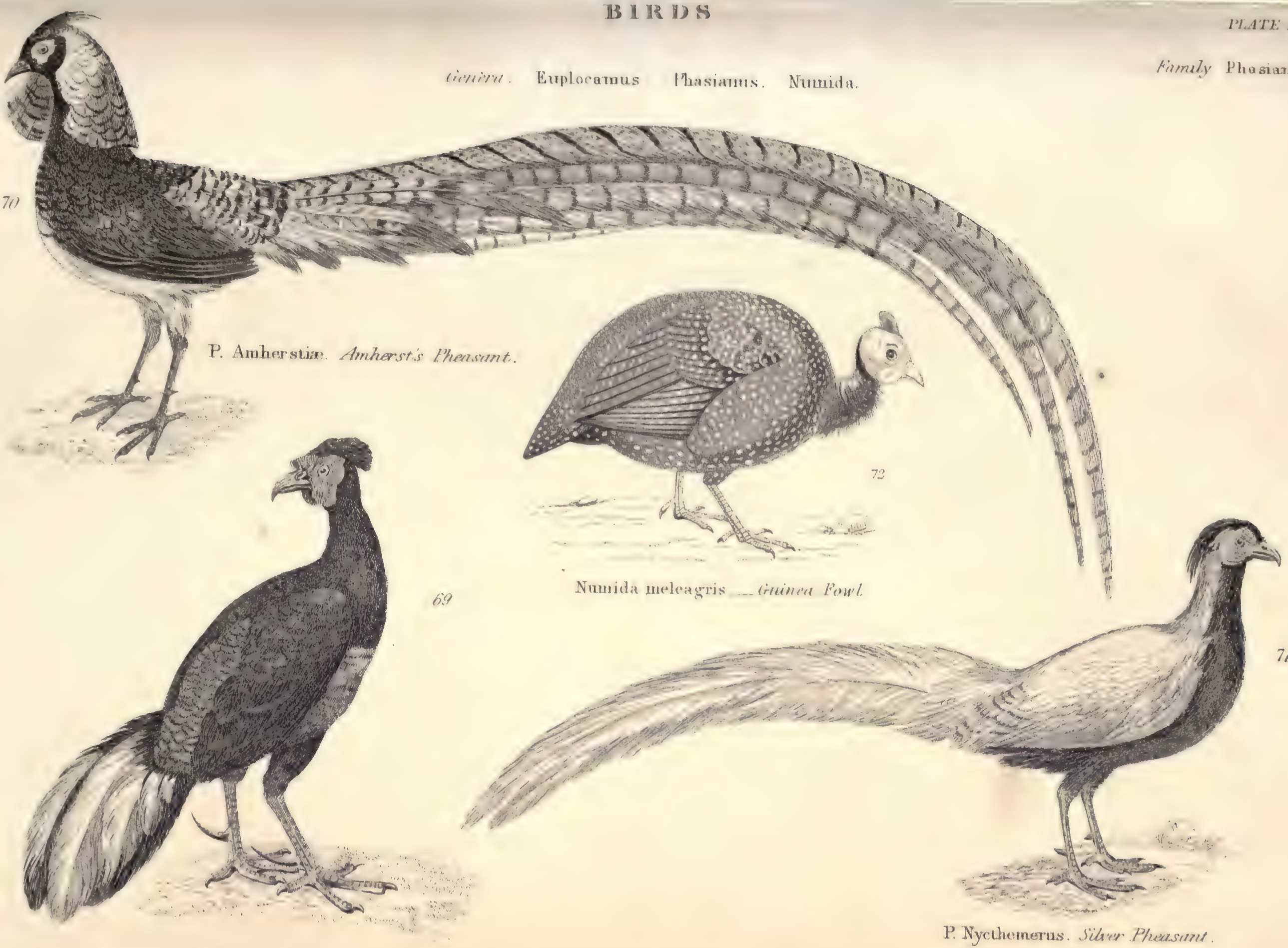
BIRDS

PLATE 19

Order. Gallinæ

Genera. Euplocamus. Phasianus. Numida.

Family Phasianidæ.



70

P. Amherstiæ. *Amherst's Pheasant.*

72

Numida meleagris — *Guinea Fowl.*

69

E. Ignitus. *Fire-backed Pheasant.*

71

P. Nycthemerus. *Silver Pheasant.*

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BIRDS

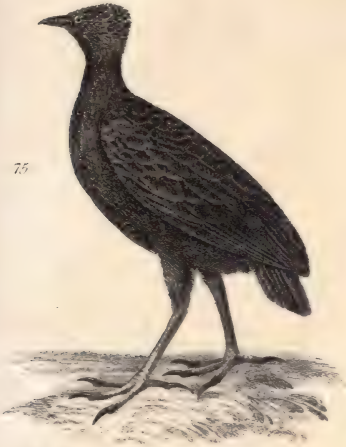
PLATE 20

Order Gallinæ

Genera. Crax Talegalla Megapodius, Perdex Rollulus Chionis.

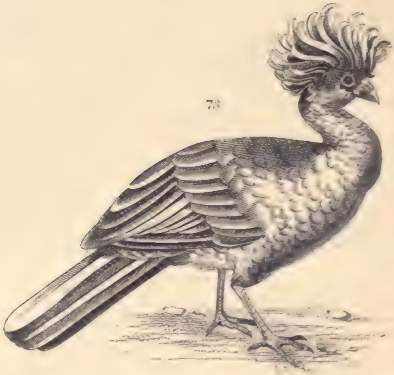
Families Cracidæ
Megopodidæ
Tetraonidæ
Chionididæ

75



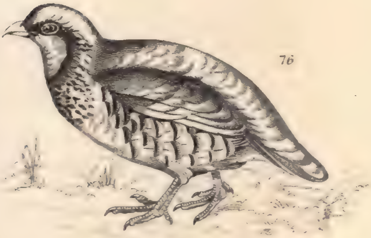
M. Freycineti.–*Freycinets Mankirio.*

73



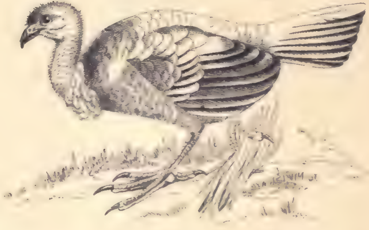
Crax alector___*Curassow*

76



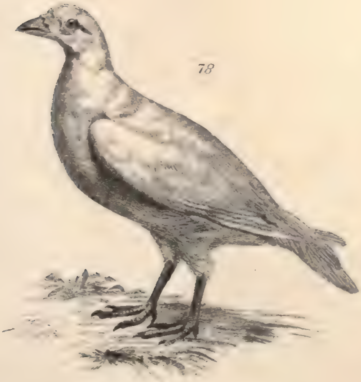
Perdex rubra___*Red legged Partridge*

74



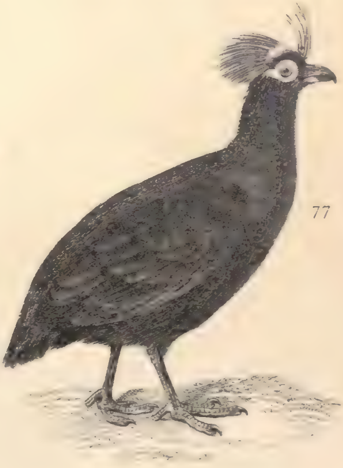
Talegalla Lathami ___ *Brush Turkey*

78



Necrophaga.–*White Sheathbill.*

77



R. Cristatus

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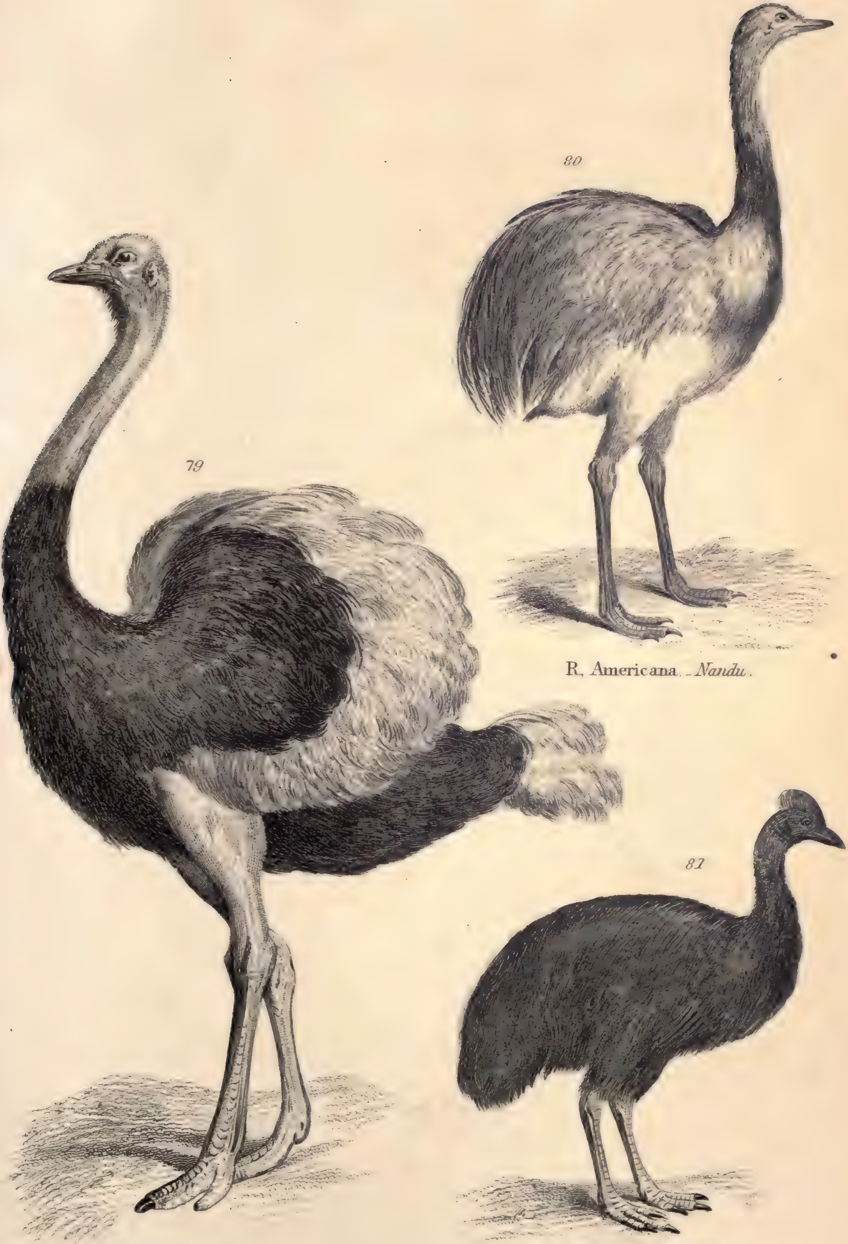
BIRDS

Order. Cursores

Family. Struthionidæ.

Genera. Struthio, Rhea, Casuarius.



79

S. Camelus _ *Ostrich*.

80

R. Americana _ *Nandu*.

81

C. Galeatus _ *Cassowary*.

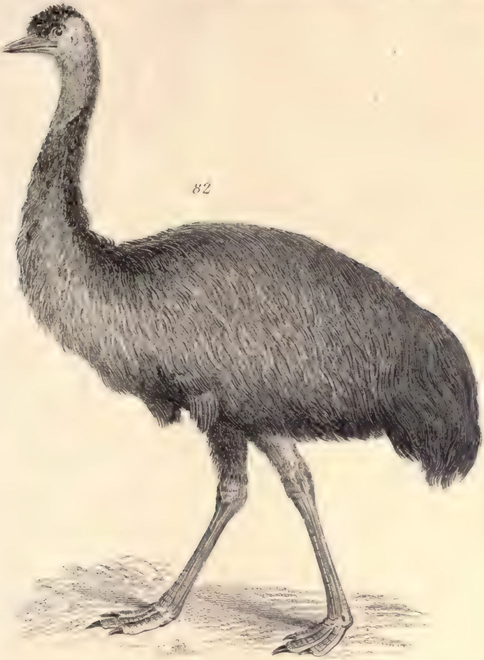
WILLIAM MACKENZIE, GLASGOW, EDINBURGH & LONDON.

BIRDS

Order Cursores Grallæ.

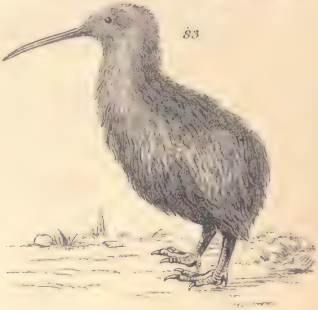
Genera. Dromaius, Apteryx Otis, Œdicnemus,

Families
Struthionidæ.
Apterygidæ.
Otididæ.
Charadriidæ.



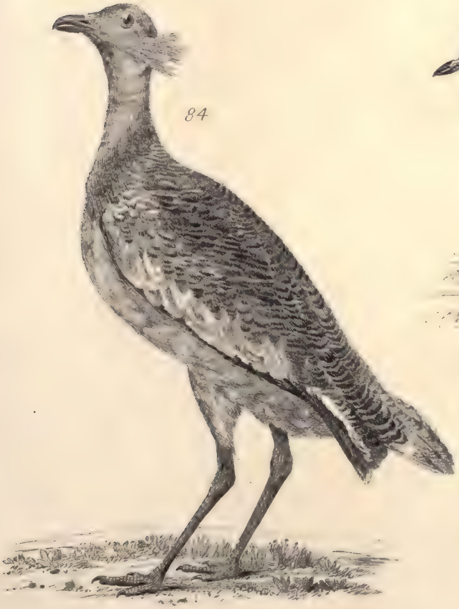
82

D. Novæ-Hollandiæ. —— *Emeu.*



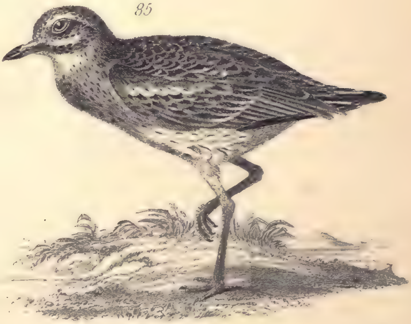
83

Apteryx Australis —— *Shaw's Apteryx*



84

O. Tarda —— *Great Bustard.*



85

Œ. Crepitans —— *Common Thick knee.*

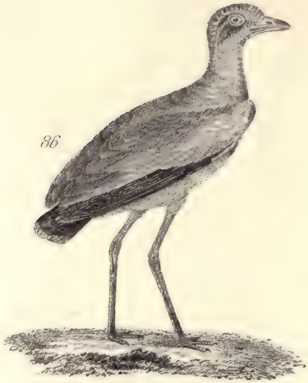
WILLIAM MACKENZIE, GLASGOW, EDINBURGH & LONDON

BIRDS

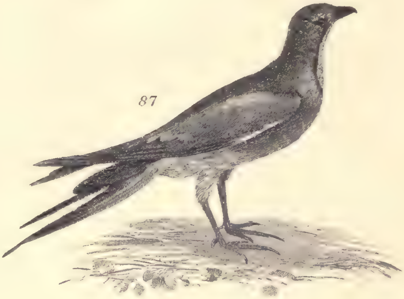
Order: Grallæ.

Families Charadriidæ.
Griudæ.

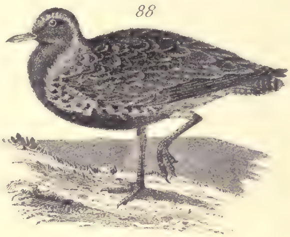
Genera. Cursorius, Glareola, Charadrius, Squatarola Hæmatopus, Cariama.



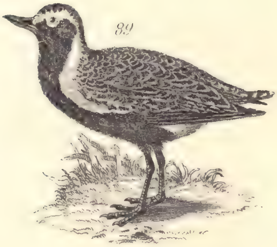
Cur. Chalcopterus._ *Brazen winged Courser.*



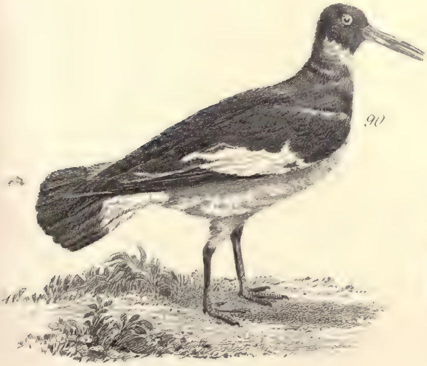
G. Torquata. *Collared Pratincole.*



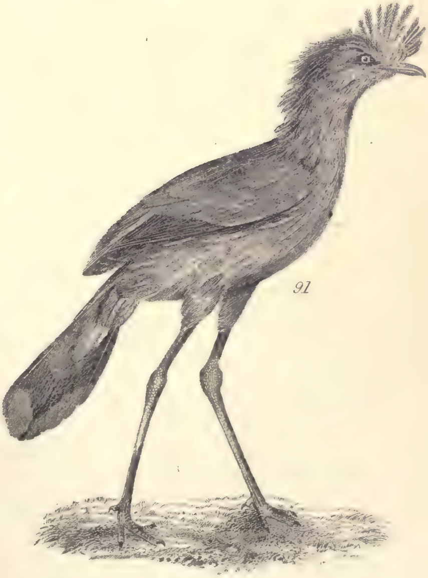
Char. Pluvialis._ *Golden Plover.*



S. Helvetica. _ *Grey Sand piper.*



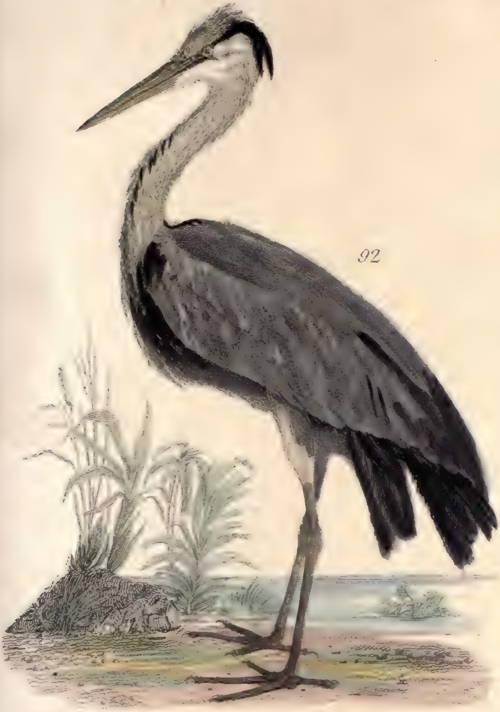
H. Ostralegus._ *Pied Oyster catcher.*



C. Cristata._ *Marcgrave's Cariama.*

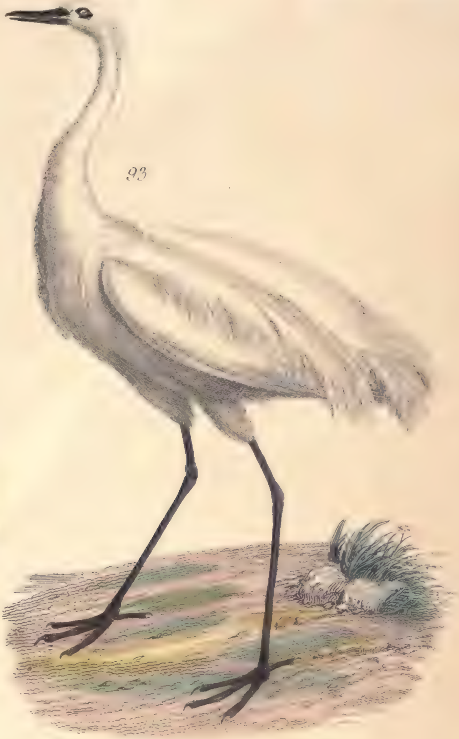
WILLIAM MACKENZIE. GLASGOW. EDINBURGH & LONDON.

Order. Grallœ. *Genera.* Ardea. Botaurus. Cancroma. *Family.* Ardeidæ.



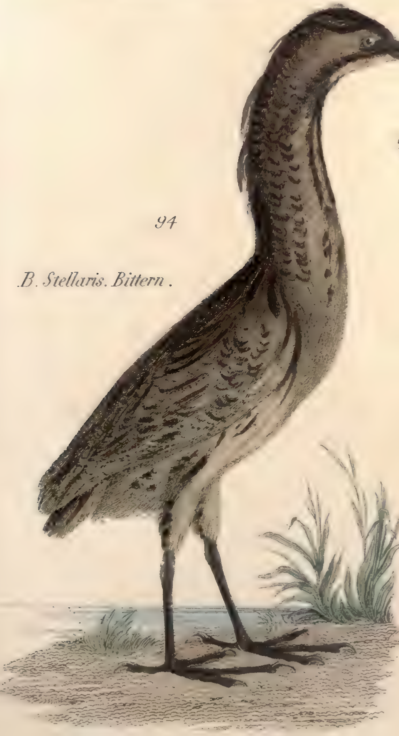
92

A. Cinerea. — Common Heron.



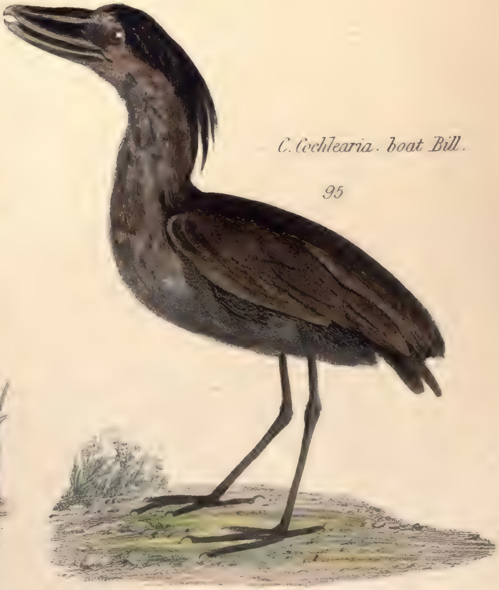
93

A. Egretta. Great Egret.



94

B. Stellaris. Bittern.



C. Cochlearia. boat Bill.

95

BIRDS

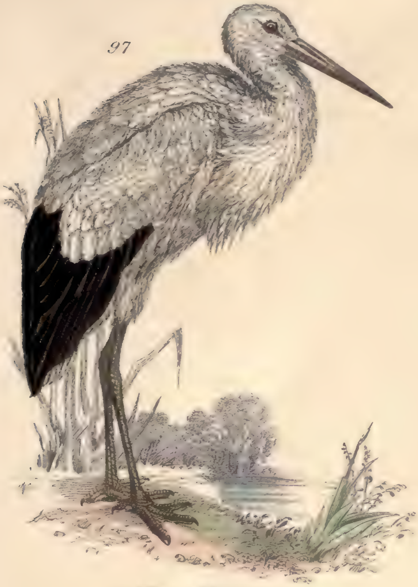
Plate 25

Order. Grallæ

Genera. Platalea. Ciconia, Mycteria.

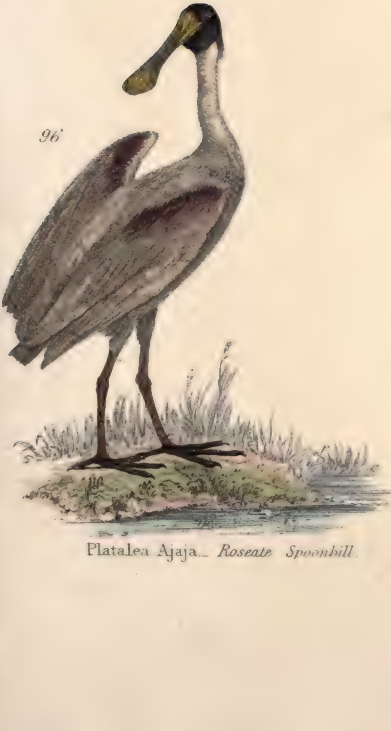
Family. Ardeidæ.

97



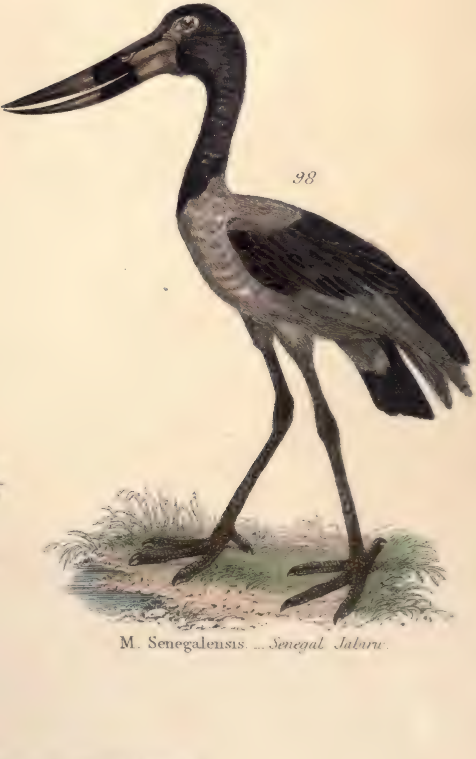
C. Alba. _ *White Stork.*

96



Platalea Ajaja._ *Roseate Spoonbill.*

98



M. Senegalensis. _ *Senegal Jabiru.*

WILLIAM MACKENZIE. LONDON, EDINBURGH & GLASGOW.

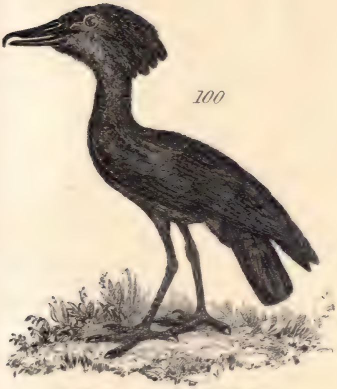
BIRDS

PLATE 26

Order. Grallæ

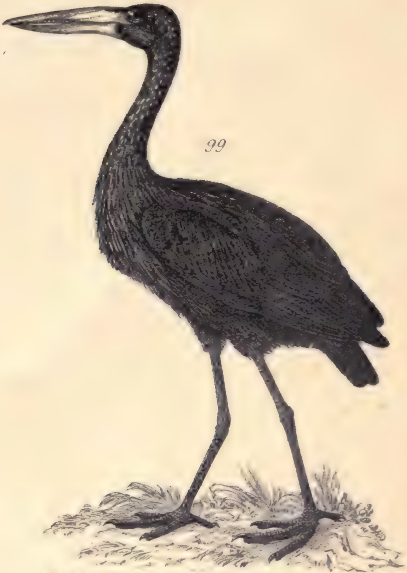
Family. Ardeidæ.

Genera. Anastomus. Scopus. Tantalus.



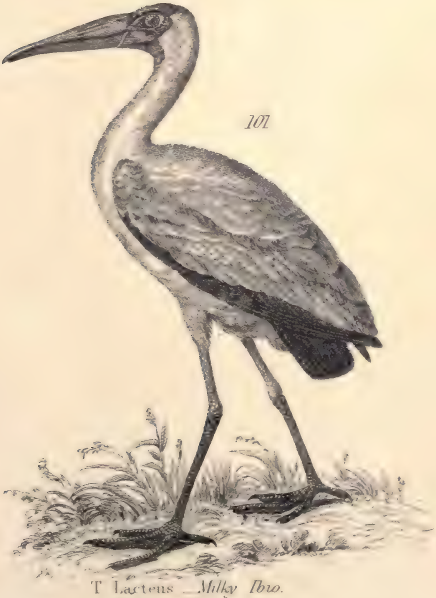
100

S Umbretta.__*Tufted Umbre*



99

A. Lamelligerus.__*Madagascar open bill.*



101

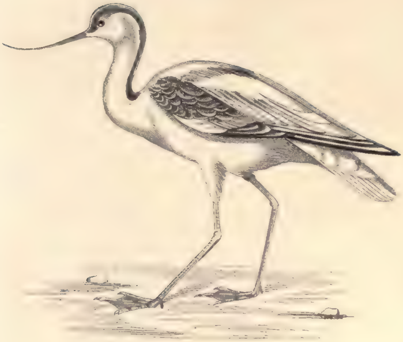
T Lacteus __*Milky Ibis.*

WILLIAM MACKENZIE, GLASGOW, EDINBURGH & LONDON.

Order: Grallæ.

Genera. Recurvirostra Scolopax. Parra.

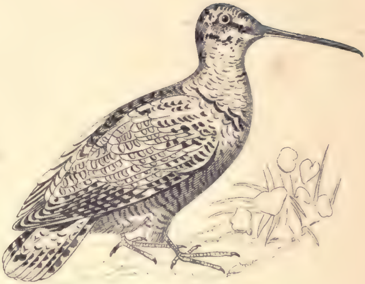
Families
- Scolopacidæ.
- Palamedcidæ.



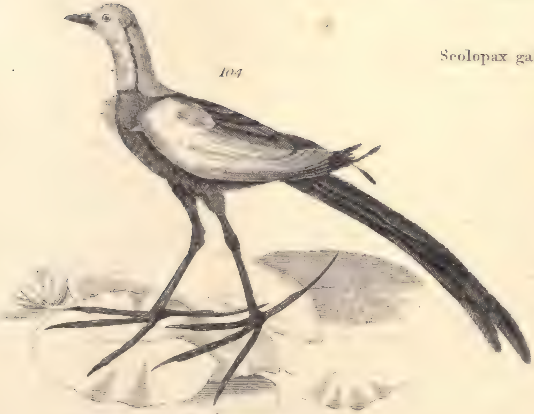
102

Recurvirostra avocetta _ *Avocet*

103



Scolopax gallinago __ *Common Snipe*



104

Parr Sinensis._ *Chinese Jacana.*

WILLIAM MACKENZIE, GLASGOW, EDINBURGH & LONDON

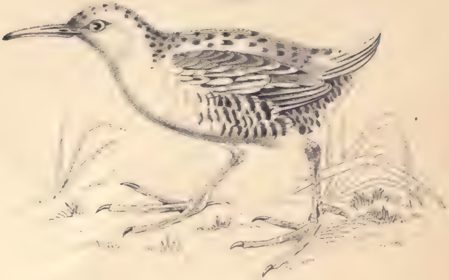
BIRDS

Order: Grallæ.

Genera. Palamedea, Rallus. Porphyrio, Gollinula.

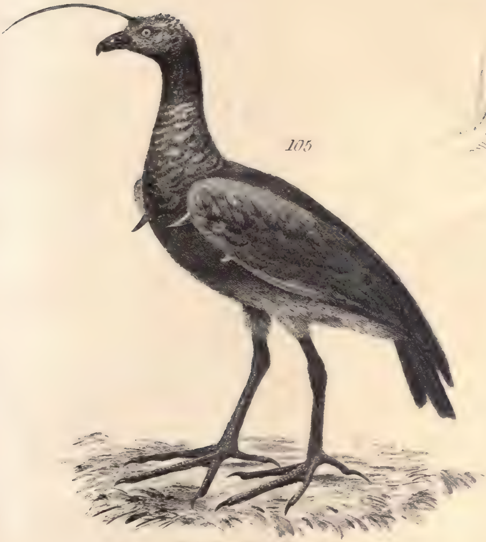
Families
Palamedeidæ
Rallidæ

106



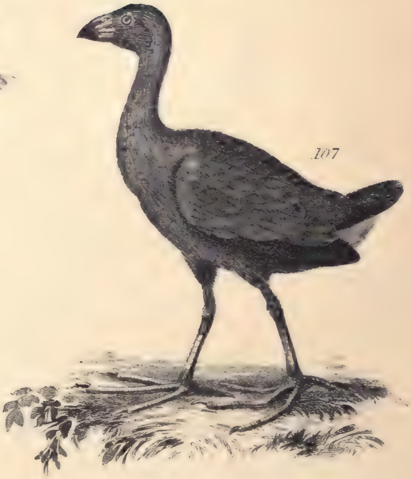
Rallus aquaticus *Water Rail*.

105



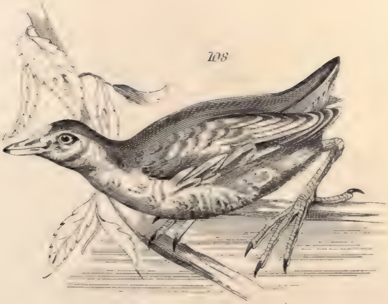
Pal. Cornuta.–*Horned Screamer*

107



Porph. Pulverulentus. *Sultana-bird*.

108



Gallinula chloropus —*Gallinule*

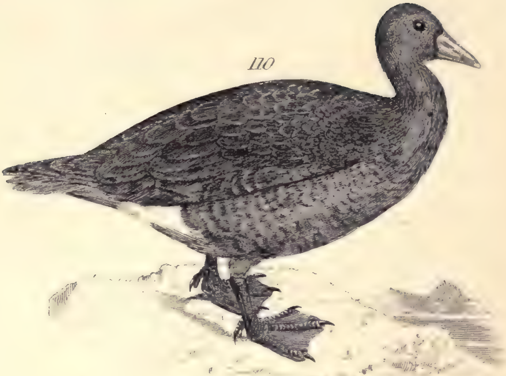
WILLIAM MACKENZIE. LONDON, EDINBURGH & GLASGOW.

BIRDS

Order: Natatores. *Family.* Anatidæ.

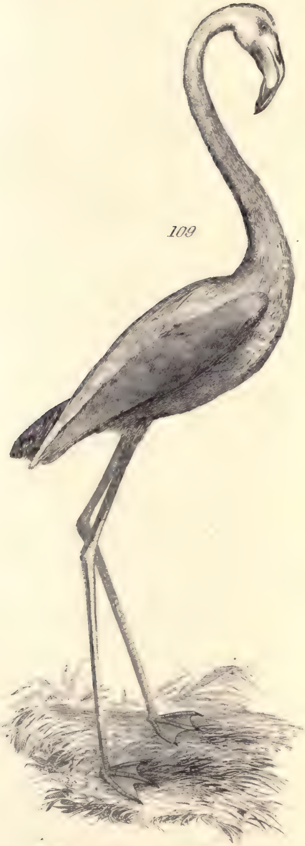
Genera Phœnicopterus, Anser, Cereopsis,

110



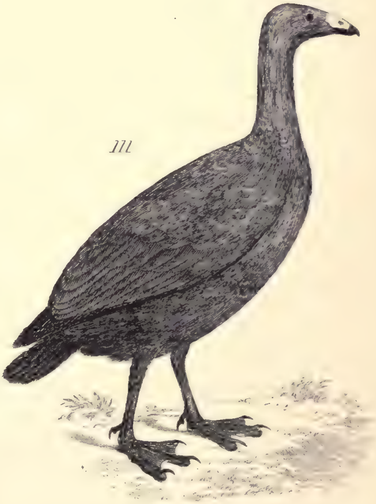
Ans. Ferus _ *Wild Goose.*

109



Phœn. Ruber. _ *Red Flamingo.*

111



Cer. Novæ Hollandiæ _ *New Holland Pigeon Goose*

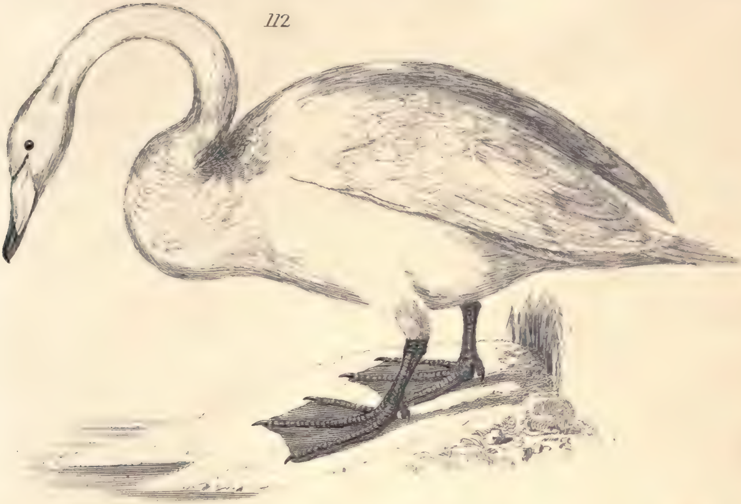
WILLIAM MACKENZIE, LONDON EDINBURGH & GLASGOW.

Genera. Cygnus. Spatula., Hydrobates, Mergus.

Order: Natatores.*

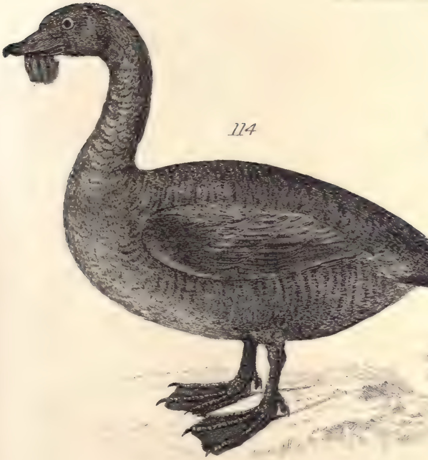
Family. Anatidæ.

112



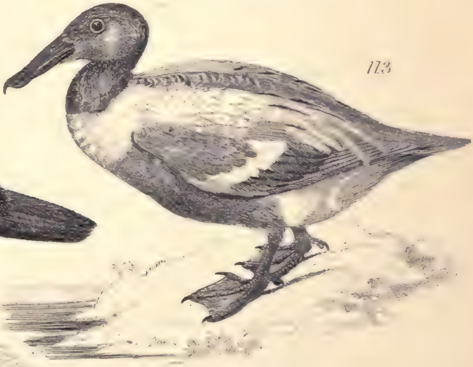
C. Ferus. — *Wild Swan.*

114



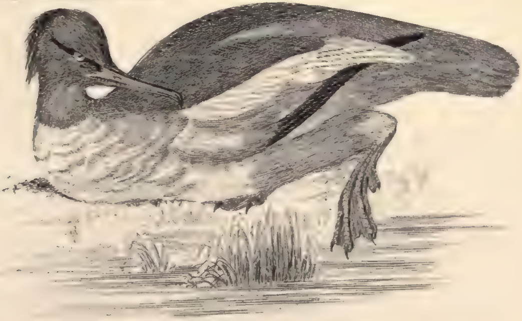
H. Lobatus — *Lobated Duck.*

113



S.. Clypeata — *Shoveller.*

115



M. Merganser ... *Goosander.*

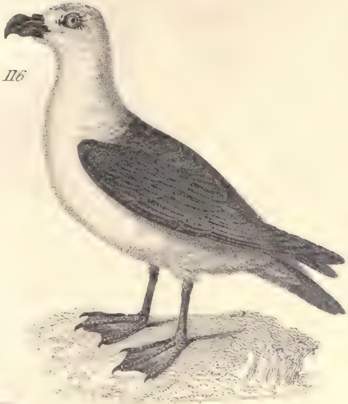
WILLIAM MACKENZIE, LONDON, EDINBURGH & GLASGOW

Order Natatores.

Families Procellaridæ

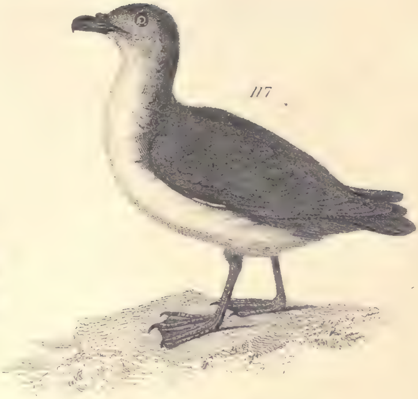
Gen. Fulmarus, Prion, Diomedea

116



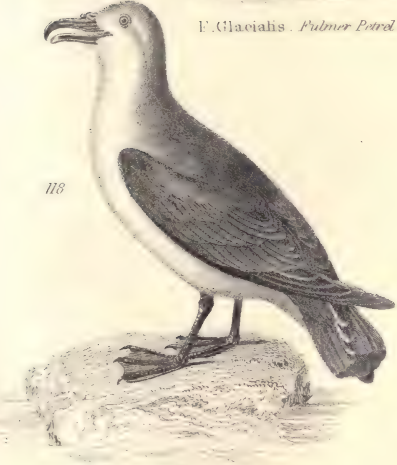
F. Glacialis. *Fulmer Petrel.*

117



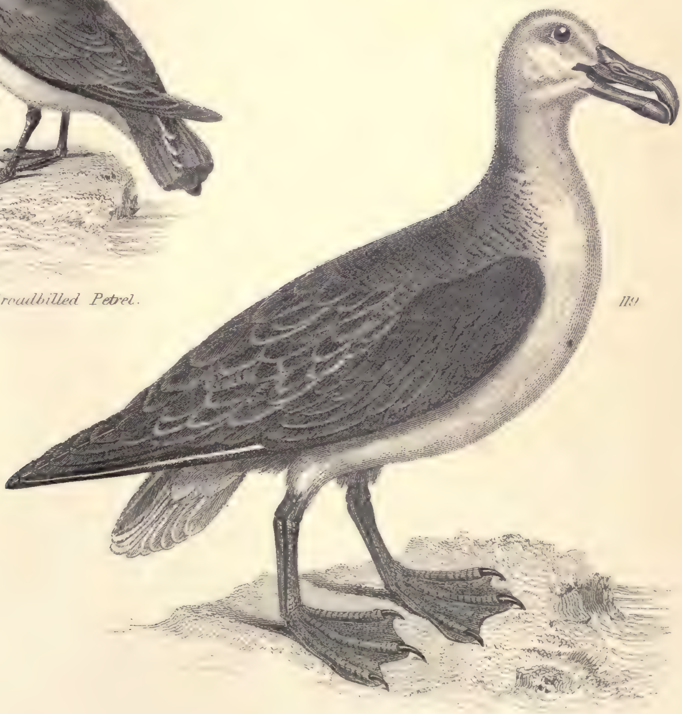
F Cookii — *Cooks Petrel.*

118



P. Vittatus. — *Broadbilled Petrel.*

119



D. Exulans — *Wandering Albatross.*

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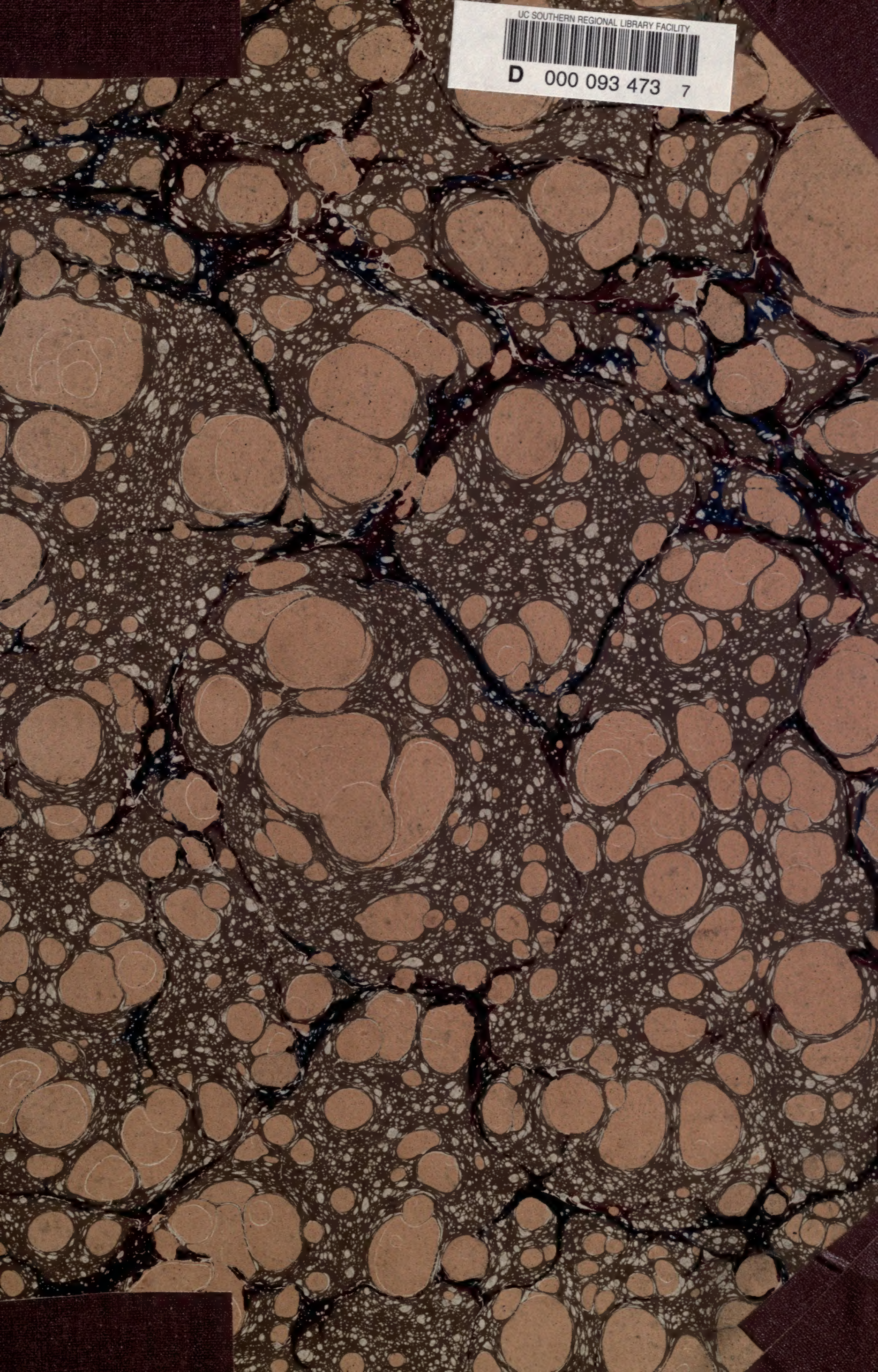

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